

CITY OF FRANKLIN
CONSTRUCTION SPECIFICATIONS AND
STANDARDS





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PART 1 - PUBLIC DRAINAGE FACILITIES

SECTION 1 – GENERAL REQUIREMENTS

1.1 GENERAL

All storm drainage shall be designed according to Virginia Department of Transportation (VDOT) Road and Bridge Specifications and Standards.

SECTION 2 – CONSTRUCTION SPECIFICATIONS

2.1 GENERAL

All storm drainage shall be constructed according to VDOT Road and Bridge Specifications and Standards unless shown otherwise in these specifications and standards.

SECTION 3 – CONSTRUCTION STANDARDS

3.1 GENERAL REQUIREMENTS

Standards delineated in the VDOT Road and Bridge Specifications and Standards shall be applicable to the construction of all storm drainage improvements within the City of Franklin. Deviations from these standards shall require written approval from the Director of Public Works.

SECTION 4 – MATERIALS

4.1 GENERAL

All materials shall be in accordance with VDOT Road and Bridge Specifications and Standards unless shown otherwise in these specifications and standards.



PART 2 - PUBLIC STREET FACILITIES

SECTION 1 – GENERAL REQUIREMENTS

1.1 GENERAL

All streets shall be designed using the Virginia Department of Transportation (VDOT) Road Design Manual and constructed according to VDOT Road and Bridge Specifications and Standards. At a minimum, right-of-way sections shall be in accordance with Details ROW_50 and ROW_80. Also, at the City of Franklin’s discretion, soil borings may be required more frequently than required by VDOT.

1.2 STREET DESIGNATIONS

All streets shall be designated according to classifications set forth by VDOT. Arterial streets shall be a variable width right-of-way as determined by the Director of Public Works. Collector streets shall have an 80’ right-of-way. Residential streets shall have a 50’ right-of-way. The classifications are arterial (Variable ROW), collector (80’ ROW), and residential (50’ ROW).

SECTION 2 – CONSTRUCTION SPECIFICATIONS

2.1 GENERAL

All streets shall be constructed according to VDOT Road and Bridge Specifications and Standards unless shown otherwise in these specifications and standards.

SECTION 3 – CONSTRUCTION STANDARDS

3.1 GENERAL REQUIREMENTS

The standards delineated on the following details shall be applicable to the construction of all street improvements within the City of Franklin. Deviations from these standards shall require written approval from the Director of Public Works.

3.2 STANDARD DETAILS

ROW_50	TYPICAL SECTION FOR 50’ ROW
ROW_80	TYPICAL SECTION FOR 80’ ROW

SECTION 4 – MATERIALS

4.1 GENERAL

All materials shall be in accordance with VDOT Road and Bridge Specifications and Standards unless shown otherwise in these specifications and standards.

PART 3 - PUBLIC WATER FACILITIES

SECTION 1 – GENERAL REQUIREMENTS

1.1 GENERAL

- A. All installations shall be in strict accordance with the Commonwealth of Virginia Waterworks Regulations –WR, latest edition, and the City of Franklin, “Construction Specification and Standards for Public Water Facilities”, Latest Revision
- B. No deviation from the Construction Specifications and Standards for Public Water Facilities and construction details approved by the City shall be allowed, unless specifically authorized in writing by the Director of Public Works, or his designee.
- C. Although constructed as parcels or sub-systems, all water pipe and related facilities of all proposed developments shall be approved on the basis of their functional integration with the City’s total public water system.
- D. The Owner/Developer shall obtain all permits for construction and operation of all proposed water facilities.

1.2 MINIMUM SIZES

- A. The minimum size of water mains for new development shall be 6” unless otherwise approved by the Director of Public Works or in the following instances:
 - When the run is less than 300 feet, 2-inch pipe may be used
 - When the run is less than 600 feet but more than 300 feet, 3-inch pipe may be used
- B. The minimum pipe size where fire protection is to be provided shall be 6-inches in diameter.
- C. The standard grading schedule of the Insurance Service Offices and other related organizations shall be followed in other cases. However, the Director of Public Works has final authority of approving water line sizes.
- D. Any departure in sizing shall be justified by hydraulic analysis and future water use and can be considered only in special circumstances.
- E. Water mains not sized to carry fire flows shall not be connected to fire hydrants.

- F. All water distribution piping shall be capable of providing an instantaneous demand flow of three gallons per minute per connection at a minimum pressure of twenty pounds per square inch (20 psi). The City of Franklin reserves the right to determine the size of any proposed water pipe that will be accepted into the system.

1.3 MINIMUM COVER

All water pipe shall be provided with a minimum of not less than 36-inches of earth-cover measured from established finished grade to the top of the pipe.

1.4 SEPARATION OF WATER PIPE AND SANITARY SEWER

- A. No general statement can be made to cover all conditions; however, for public wells or other public water supply sources and structures, and for all other potable water supply wells or potable water supply, sewers shall meet the requirements of the WR, latest edition, with respect to minimum distances from water supply wells or other water supply sources and structures.
- B. No sewer pipe shall pass within 50 feet of a potable water supply well or other potable water supply source or structure unless special construction and ductile iron pipe materials are used to obtain adequate protection. The Owner/Developer is referred to the current edition of the WR for separation of water mains and sewers. The proposed design shall identify and adequately address the protection of all potable water supply structures within 100 feet of the proposed project premise.
- C. The following factors shall be considered in providing adequate separation of water mains:
- Materials and types of joints for water and sewer mains
 - Soil conditions
 - Service branch connections into the water main and sewer mains
 - Compensating variations in the horizontal and vertical separations
 - Space for repairs and alterations of water and sewer mains
 - Offsetting of pipes around manholes
 - Identification of the physical restraints preventing normal separation

1.5 PARALLEL INSTALLATION

- A. Under normal conditions water mains shall be laid at least ten feet, horizontally from any existing sewer or sewer manhole wherever possible. The distance shall be measured edge-to-edge.
- B. When local conditions prevent a horizontal separation of ten feet, the water pipe may be installed closer to a sewer provided that the invert elevation of the water

pipe is at least 18-inches above the top of the sewer and installed on an undisturbed earth shelf. Where this vertical separation cannot be obtained, the pipe must be constructed of AWWA approved water pipe. The sewer manhole shall be of watertight construction and tested in place to assure zero leakage.

1.6 CROSSING

- A. Under normal conditions water pipes crossing over sewers shall be constructed to provide a separation of at least 18-inches between the invert elevation of the water pipe and the top of the sewer wherever possible.
- B. When local conditions prevent a vertical separation described above, sewers passing over or under water pipes shall be constructed of AWWA approved water pipe. Water mains passing under sewers shall have a vertical separation of at least 18-inches between the invert elevation of the sewer and the top of the water pipe and be installed centering the water pipe and sewer at the point of crossing so that the joints are equidistant and as far as possible from the sewer. Adequate structural support shall be provided to prevent excessive deflection of the joints, settling or breaking of the water pipe. In addition, no water pipe shall pass through or come in contact with any part of a sewer manhole.

1.7 LOCATION OF WATERLINES

As a general rule, sewers shall be placed in the right-of-way at a location deemed most suitable by the City for proper construction. Upon approval by the Director of Public Works, sewers may be constructed on private property if it is the only feasible way to serve isolated properties, low lots, or to make necessary connection to another sewer. In this case a utility easement of not less than twenty (20) feet shall be provided for all sewers on private property. For interceptors, the easement shall be twenty (20) feet with suitable width construction easements provided. The Director of Public Works may require a wider easement depending on the depth of the line.

SECTION 2 – CONSTRUCTION SPECIFICATIONS

2.1 GENERAL PROCEDURES

- A. Hydraulic analyses shall be computed for all proposed service areas. Pipe size design shall be based on full area development as defined by the City of Franklin Master Water Plan. All water pipe shall be looped wherever possible. All systems and sub-systems shall be designed to eliminate cross connections and back siphonage. Where unavoidable dead ends occur, they shall be provided with a fire hydrant or an adequate sized blow-off assembly as shown in Detail WD_05 – Blow-Off Assembly.
- B. Pipe, fittings, valves, hydrants, and accessories shall be loaded and unloaded by lifting with hoists to avoid shock or damage. Under no circumstances shall any components be dropped. Pipe shall not be skidded or rolled against pipe already

on the ground. Pipe shall be handled so that the coating and lining shall not be damaged. Damaged items shall be either repaired or replaced at the discretion of the authorized City representative or agent. The water pipe shall be laid and maintained to the required lines and grades with fittings, valves, hydrants, and accessories set at the required locations as indicated on the approved plans for the project. Water pipe shall be located in the roadway three-feet off the edge of the gutter pan unless the Director of Public Works specifically authorizes another location. Hydrants and valves shall be located between the water pipe and the property line. All valve and hydrant stems shall be set plumb. Wherever obstructions not shown on the plans are encountered during progress of the work and which interfere to such an extent that an alteration in the plans is required, the City authorized representative shall be advised and approval by letter given before such alterations are put into effect.

- C. All pipes shall be installed according to the manufacturer's recommendations as approved by the City. No pipe shall be laid in water, or when, in the opinion of the City representative or agent, trench conditions are unsuitable.
- D. No flushing device should be connected to any sewer or manhole.

2.2 INSTALLATION

A. EXCAVATION

Excavation shall be performed to the dimensions and depths specified or shown on the Owner/Developer's approved plans. Ledge rock, boulders, and large stones shall be removed to provide a clearance of at least six inches below and on each side of all pipe, valves, and fittings for pipes 24-inches in diameter or less, and twelve inches for pipes larger than 24-inches in diameter. The specified minimum clearances are the minimum clear distances, which will be permitted between any part, projection, or point of such rock, boulder or stone.

In the event that unstable material is encountered at or below the excavation depth, the City of Franklin shall be notified. Such materials shall be removed and replaced with suitable materials, which shall be furnished as an ordinary and integral part of excavation and backfill. If excavation of any nature has been made deeper than necessary, then a layer of suitable granular backfill shall be placed to secure a firm foundation for the pipe.

Temporary erosion and siltation control measures shall be applied to erodible materials exposed by any activity associated with the project construction, including local material sources, waste areas, and haul roads. All control methods shall comply with the Virginia Erosion and Sediment Control Handbook, current edition. All temporary measures applied shall be economical, effective, and continuous in providing erosion and siltation control.

B. TRENCHING

The trench shall be dug so that the pipe can be laid to the alignment and depth required and it shall be excavated not more than 200 feet in advance of the complete pipe laying operation. The width of the trench shall be ample to permit the pipe to be laid and jointed properly and the backfill to be placed and thoroughly compacted in accordance with the plans and specifications. Trenches shall be of such extra widths when required as will permit the convenient placing of timber support, sheeting and bracing and handling of special fittings. Bell holes shall be provided at each joint to permit proper joint construction and inspection. In no case shall the pipe bells be used to support the body of the pipe.

C. DRAINAGE

Grading shall be controlled in the vicinity of excavations so that the surface of the ground will be properly sloped to prevent water from running into trenches or other excavated areas. Any water, which accumulates in the excavations, shall be removed promptly. Trenches shall be kept dry while pipe is being laid.

D. PIPE INSTALLATION

Stockpiled pipe materials shall be handled by mechanical equipment and placed to avoid interference with traffic and the trenching operation.

Bedding material shall be provided for all pipes in accordance with EW_01 – Pipe Bedding Details. The bottom of the trench shall be carefully shaped to the curvature of both the bell and barrel of the pipe. Continuous and uniform bedding shall be provided in the trench for all pipes so that the pipe barrel bears on and is supported at every point between bell holes. Trenching below the specified grade shall be backfilled with approved granular material and thoroughly compacted. The finished sub-grade shall be prepared accurately by means of hand tools. Where excavation is made in rock or boulders the sub-grade shall be made by backfilling with crushed stone or clean selected soil, which shall be thoroughly compacted.

Before the pipe is lowered into the trench, each section of pipe shall be thoroughly inspected for defects and shall be swabbed or brushed out to ensure that no dirt or foreign material gets into the finished pipe. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed.

When installing pipe in the trench, proper implements, tools and facilities satisfactory to the City and as recommended by the material manufacturer should be provided and used by the Owner/Developer for the safe and convenient installation. All pipe, valves, fittings, and hydrants and accessories shall be carefully lowered into the trench piece-by-piece, by means of derricks, ropes, slings, or other suitable tools or equipment in such a manner as to prevent damage to water pipe materials and any protective coatings and linings. Lifting equipment

shall be satisfactorily rated to handle the pipe and fittings required. Under no circumstances shall water pipe materials be dropped or dumped into the trench.

During the laying operation no debris, tools, clothing or other materials shall be placed in the pipe and the trench shall be kept free of water. Before jointing the pipe, all lumps, blisters, excess coating material, oil or foreign material shall be removed from the bell and spigot ends of the pipe and fittings shall be kept fully closed by a test plug to prevent earth, water, or other substances from entering the pipe.

Pipe shall be laid true to line and grade and shall be joined together such that the completed pipe will have a straight horizontal and vertical alignment. After placing a length of pipe in the trench, the spigot end shall be centered in the open bell of the previously laid pipe and the joint completed in accordance with pipe manufacturer instruction manual.

All joints shall be watertight and any leaks or defects discovered shall be immediately repaired to the satisfaction of the City. Any pipe, which has been disturbed after being laid shall be taken up, the joints cleaned, and the pipe properly relayed. Any superfluous material inside the pipe shall be flushed or removed by means of an approved follower or scraper after joints are made. Installation of fittings and pipe joints shall be in strict accordance with the manufacturer's recommendations.

The cutting of pipe for inserting valves, fittings or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe or lining in order to leave a smooth end at right angles to the axis of the pipe. Only qualified and experienced workmen shall be used on this work. The cutting of pipe by means of an oxyacetylene flame torch shall not be allowed.

Wherever it is necessary to deflect pipe from a straight line either in the vertical or horizontal plane to avoid obstructions or to plumb stem, or where long-radius curves are permitted, the amount of deflection allowed shall not exceed that required for satisfactory joining of the pipes, as specified by the AWWA and the manufacturer's recommendations. Pipe shall be installed as described above in a straight line, and then deflected as necessary. If the specified or required alignment requires deflections exceeding those recommended, the Owner/Developer shall provide bends approved by the City.

Road crossing shall be installed in accordance with the requirements of VDOT, which governs the method, and materials of such construction. The developer is required to obtain all needed permits.

Roadways and driveways, grass plots, sod, shrubbery, ornamental trees, signs, fences, or other improvements on public or private property which have been damaged or remove in excavating, shall be restored to conditions at least equal to that which existed prior to construction. Materials for roadway, alleys, or driveways shall be compacted to at least 95 percent of the maximum density as



determined by the Road and Bridge Specifications of the VDOT. The cost of this compaction and furnishing new materials shall be at the expense of the Owner/Developer.

The site restoration of the entire construction area shall be finished in a neat and uniform condition acceptable to the City of Franklin.

E. BACKFILL

Clean earth, sand, crushed stone, or other material approved by the City shall be used for backfill. Material suitable for backfill shall be selected, deposited, and compacted to eliminate the possibility of lateral displacement of the pipe. Backfill material containing pieces no greater than one inch in size shall be placed evenly and carefully around the pipe and shall be placed evenly and carefully around the pipe and shall be solidly hand-tamped in 6-inch layers up to a level at least one foot above the top of the pipe. Backfilling shall be carried out simultaneously on both sides of the pipe.

The remainder of the backfill shall be deposited and compacted by mechanical tamper except in areas where paving is to be placed over the backfilled trench. In these areas compaction shall achieve a density of at least 95 percent of the maximum density as determined by the Road and Bridge Specifications of the VDOT Compaction test, at the Owner/Developer's expense, may be required to determine if proper compaction has been obtained.

2.3 FITTINGS AND ACCESSORIES RESTRAINTS

- A. All 1/16 and sharper bends, tees, and dead ends (including fire hydrants) shall be securely blocked in the direction of flow.
- B. Ductile iron pipe shall be restrained with Mega Lug type restraint system or approved equal restraint together with lengths of restrained joint pipe as detailed in accordance with DIPRA specifications for such pipe.
- C. Polyvinylchloride pipe shall be restrained with PVC Mega Lug, or approved equal restraint together with lengths of restrained joint pipe as detailed in accordance with PVCRA specifications for such pipe

2.4 VALVES AND HYDRANTS

A. GENERAL

Valves and hydrants shall have the interiors cleaned of all foreign matter before installation. Stuffing boxes shall be tightened and the hydrants or valves shall be inspected in opened and closed positions to see that all parts are in working condition.

B. VALVES AND VALVE BOXES

All valves shall be provided with valve boxes. Extension stems for buried valves shall be of sufficient length so that the operating nut will not be lower than 36-inches below grade. Valves and valve boxes shall be set plumb with the valve boxed centered directly over the valve operators. After being correctly positioned, earth fill shall carefully tamped around the valve box to a distance of at least four feet on all sides of the box or to the undisturbed trench face if less than four feet. Before installing any valve, care shall be taken to see that all foreign material is removed from the interior of the barrel and the valve operated to see that all parts are in working condition. Valves shall be installed at a maximum spacing of 1,000 feet along the pipe and at all intersections of streets and roads for controlling the flow in the pipe network.

If possible, valves and valve boxes shall be located inside the area of existing or proposed paved roads and streets. In off-street areas, they shall be set and adjusted so that the covers are exposed and flush with the finished grade. Where valves and valve boxes are or will be located within paved areas, they shall be set and adjusted so that the cover is exposed and flush with the finished surface. If the paved surfaces are renewed or replaced by the Owner/Developer after the related water system has been approved and accepted by the City, but while such paved areas or streets are still the obligation of the Owner/Developer, the valve boxes therein shall be re-adjusted relative to the elevation of the finished surface.

No water pipe shall terminate under a concrete gutter, and no valves shall be located under a concrete gutter.

Pits or chambers for valves, meters, or blow-offs shall not be connected to any storm drain or sanitary sewer.

C. HYDRANTS

In general, fire hydrants shall have a 4½ -inches clear opening through the valve and shall be located at street intersections and at the ends of long dead-end streets. The maximum distance between fire hydrants shall be 1000 feet vehicular travel distance. Unless the location of hydrants is specifically indicated otherwise, they shall be located so that their center is not less than seven or more than nine feet from the back of the curb or the edge of the adjacent street. The hydrant shall be set upon a bed of Number 57 stone not less than 8-inches thick and 18-inches square. Hydrant drains shall open freely into this stone bed. Hydrant drains must not be connected to sanitary sewers or storm drains.

Only 6-inch ductile iron branch pipe shall be used to connect the hydrant to the water main. Hydrants must be connected only to water systems adequately designed for fire flows in addition to domestic flows. This is typically understood to mean pipes of at least 6-inches in diameter. Each hydrant shall be preceded with a gate valve with valve box. Hydrants shall be installed to finish grade at the buried line of the hydrant. The pump connection shall face the street. The

connecting pipe will have the same depth of cover as the distributing pipe. The backfill around hydrants shall be thoroughly compacted to the grade line. Hydrants shall not be installed within 5 feet of any obstruction.

2.5 SURFACE WATER CROSSINGS

A. ABOVE WATER CROSSING

Where a water main crosses above surface water, the pipe shall be adequately supported, completely insulated to protect it against freezing, accessible for repair or replacement and above the level of a 100 year flood and any floating debris the flood water may carry.

B. UNDER WATER CROSSINGS

1. The water pipe shall be of special construction, having flexible Watertight joints. The pipe material used shall be subject to the City's approval. The Owner/Developer may be required to install the pipe in a concrete encasement.
2. Valves shall be provided at both ends of the water crossing so that the section can be isolated for tests or repair. The valves shall be easily accessible and not subject to flooding.
3. Sample taps shall be available at each end of the crossing and at a reasonable distance from each side of the crossing. Sample taps should not be subject to flooding. Permanent taps shall be made for testing and locating leaks.

2.6 ROAD CROSSING

Water pipe crossing under roads shall be installed in accordance with the details shown and with the requirements of the VDOT and the City of Franklin Construction Specifications and Standards. Crossings shall be accomplished prior to construction of adjacent sections of the project.

Either auger boring or jacking the casing beneath the roadbed of primary roads shall install steel pipe casing. The Owner/Developer should make every effort to insure successful completion of bored road crossings through the use of test holes, pilot drill holes, etc.

Casing pipe required for bored installations shall be uncoated steel with minimum 3/8-inch walls and 36,000-psi yield strength. Casing pipe sections shall be continuously welded at joints as the casing is advanced. Casing pipe 30 inches in diameter & larger shall have a minimum thickness of 0.500 inches.

2.7 SPECIAL CROSSING

A. STREAM CROSSINGS

Where stream crossings are required in water construction, the pipe shall be ductile iron, mechanical joint pipe of the same size interior diameter as the pertinent sewer, or the next larger in ductile iron if an equal size is not available. A minimum of one foot of cover over the crown of the water shall be provided where the natural bottom of the stream is rock and three feet of cover where the bottom is other material.

All stream crossings shall be installed in accordance with the recommendations of the City and the approved plans for the construction project. Stream crossings must be tested in place and show zero leakage. Provisions for such test shall be incorporated in the design.

B. HIGHWAY AND RAILROAD CROSSINGS

Where required, crossings under highways shall be installed in accordance with the requirements of the VDOT. Crossings of railroads shall be installed in accordance with the requirements of the Railroad Company. Encased crossings shall be accomplished prior to the construction of adjacent sections of the project. Safety precautions will be required while performing the crossing work.

Horizontal auger boring and jacking of pipe or tunneling under pavement shall be done only upon prior written approval by the City. The Owner/Developer shall submit a detailed schedule of operation indicating the exact method and equipment to be used. Only workmen skilled in this class of work shall be employed.

Casing pipe or tunnel liner, as required, shall be installed beneath the roadbed. If obstructions require relocation of the casing, the unfinished cavity shall be filled with 2500-psi concrete pneumatically grouted in place.

Casing pipe required for bored installations shall be uncoated steel with minimum 3/8-inch walls and 36,000-psi yield strength. Casing pipe sections shall be continuously welded at joints as the casing is advanced.

The water pipe shall be installed in the casing with proper care exercised to insure that the pipe sections remain completely joined. All pipes shall be properly restrained. Upon completion and testing of the water pipe, the ends of the casing shall be closed as directed by the Authorized City Representative or Agent.



SECTION 3 – CONSTRUCTION STANDARDS

3.1 GENERAL REQUIREMENTS

The standards delineated on the following details shall be applicable to the construction of all water improvements within the City of Franklin. Deviations from these standards shall require written approval from the Director of Public Works.

3.2 STANDARD DETAILS

WS_01	STANDARD VALVE BOX FRAME AND COVER
WS_02	VALVE SETTING DETAIL
WS_03	MANUAL AIR VENT ASSEMBLY
WS_04	STEEL CASING DETAIL
WD_05	BLOW-OFF ASSEMBLY
WD_07	FIRE HYDRANT SETTING
WD_09	TEMPORARY MANIFOLD FOR TEST AND CHLORINATION
EW_01	PIPE BEDDING DETAILS
WSD_01	TYPICAL WATER SERVICE DETAIL

SECTION 4 – MATERIALS

4.1 GENERAL

Pipe size, type, joint, and class shall be designated on the plans. Unless otherwise approved in writing by the City, or as specifically indicated on plans approved by the City, all pipe fittings, and accessories shall be as delineated in this section.

4.2 WATER PIPE

A. DUCTILE IRON PIPE

Ductile iron pipe shall be centrifugally cast pipe manufactured in accordance with ANSI/AWWAC262/A21.51, latest edition. Ductile iron pipe shall be cement-mortar lined in accordance with ANSI/AWWAC104/A21.4, latest edition. Ductile iron pipe shall be minimum Special Thickness Class 50 with a pressure rating of 350 psi.

Joints for ductile iron pipe shall be one of the following:

1. RUBBER GASKET (PUSH ON) TYPE JOINT

Rubber gasket type joints shall be manufactured in accordance with ANSI/AWWA C111/A21.11, latest edition and designed to lock against displacement without caulking. The gasket shall be a resilient rubber of heavy section; high durometer ASTM D2240, latest edition test method, and

single molded and shall be installed in accordance with the pipe manufacturer's recommendations. The gasket lubricant shall be non-toxic, tasteless, odorless grease that will not support bacteria. Each gasket lubricant container shall be labeled with the trade name and the pipe manufacturer's name.

2. MECHANICAL JOINT

Standard mechanical joints shall be manufactured in accordance with ANSI\AWWA C111/A21.11, latest edition. The mechanical joint bolts shall be an U.S. Standard size, high strength, and corrosion resistant steel alloy with hexagon nuts.

Mechanical joints shall be used for the connection of all fittings, valves, and hydrants.

B. AWWA POLYVINYL-CHLORIDE PIPE

Pipe shall be manufactured in accordance with ANSI/AWWA C900, latest edition to cast iron pipe outside diameter dimensions and be approved by Underwriters Laboratories. Class 150 pipe shall meet the requirements of DR 18. Joints shall consist of an integral wall section with solid cross section rubber gasket conforming to ASTM D-1869., latest edition. Pipe shall be clearly marked to show class, size and manufacturer's name.

A detectable tape identifying PVC water pipe with the words "CAUTION: WATER LINE BURIED BELOW" shall be installed 6 to 12-inches above the pipe. In addition a 12 gauge copper wire shall be installed and taped along the pipe for purposes of positive identification and location. The tape shall be Terra Tape D (Blue) as manufactured by Griffolyn Co., Inc. or approved equal.

C. SERVICE CONNECTION AND METER BOX

Type K Copper tubing with flare fittings in accordance with ASTM B88 shall be used as service pipe.

4.3 FITTINGS

Fittings shall be manufactured of cast or ductile iron and shall be in accordance with the requirements of ANSI/AWWA C110/A21.10, latest edition. Fittings shall be compatible with the pipe and shall provide at least equal resistance to internal and external loads on the pipe. Fittings shall be asphalt seal coated and cement mortar lined according to ANSI/AWWA C104/A21.4, latest edition. Compact ductile iron fittings for use with pipe 16 inches and smaller manufactured in accordance with AWWA C153 may be used.

4.4 CORPORATE STOPS

At each service connection and where directed by the authorized City representative or agent, corporation stops of sufficient size with straight couplings as manufactured by Mueller Company, Ford Meter Box Company, Inc. or approved equal, shall be furnished and installed. The corporation stops tapped into the water pipe at an approximate angle of 45° from the vertical. Corporation stops tapped into PVC pipe shall be installed through double strap ductile iron service saddles furnished with stainless steel nuts and washers and shall be Ford Meter Box No.202, or approved equal. The materials and installation of corporation stops shall comply with all the applicable AWWA Specifications.

4.5 VALVE AND VALVE BOXES

A. BUTTERFLY VALVES

Butterfly valves shall be cast iron, rubber seated, tight-closing type and shall be in accordance with ANSI/AWWA C504, Class 150B, latest edition. Butterfly valves which will be acceptable are Dresser “450” or an approved equal. The valves shall be suitable for buried service. All valve ends shall be mechanical joint conforming to ANSI/AWWA C111/A21.11, latest edition.

All valves shall use full Class 150B underground service operator torque rating throughout entire travel. Butterfly valves shall include traveling nut or worm gear operator with standard AWWA operating nut opening by turning left. The valve operator shall be sealed, gasketed, lubricated for underground service and completely suitable for its particular application.

Butterfly valves shall be used where valves larger than 12 inches are required, unless otherwise noted.

B. GATE VALVES

Gate valves ¾” and smaller shall be inside screw, solid bronze, tapered seat, and double disc construction for 250 psi working pressure. The valves shall be suitable for the service required. Gate valves larger than ¾” inches shall AVK or approved equal.

C. DETECTOR CHECK VALVES

Detector check valves shall be a minimum 6-inch, gray cast iron in accordance with ASTM A126 Grade B, flanged, with by-pass meter ports and 175 psi working pressure weighted clapper Watts and Febco, or approved equal. By-pass meter shall be latest version of Neptune Technologies with shut-off valves and check valve. Inlet and outlet gate valve shall be outside stem and yokes, flanged assemblies, ANSI/AWWA C500, latest edition.

D. VALVE BOXES

Valve boxes shall be installed for all valves, which are buried beneath finished grade elevation. Valve boxes shall be cast iron #2 valve box with truss pipe or C900 as shown in Detail WS_02 – Valve Setting Detail. The cover or head shall be round and shall have the word “WATER” cast upon it. Boxes shall be coated with asphalt paint.

4.6 AIR RELEASE VALVE ASSEMBLIES

A. Air release valve assemblies shall be installed at high points in the main or where required otherwise. Each assembly shall be of the following type as directed by the authorized City representative or agent. Installation under pavement subject to vehicular traffic is prohibited unless a variance is approved by the Director of Public Works.

1. Manual. Each assembly shall consist of an approved two-inch corporation stop, a riser pipe of suitable length, a two-inch gate valve in accordance with section 4.5, Article B of this Part II and shall be installed as per Detail WS_03 – Manual Air Vent Assembly.

The air release valve assembly enclosure or chamber shall have a cast iron frame and cover equal to Dewey Brothers Model B-1200. Valve boxes shall be cast iron #2 valve box with truss pipe or C900 as shown in Detail WS_02 – Valve Setting Detail.

B. BLOW-OFF ASSEMBLIES

Blow-off assemblies shall be installed at all pipe dead ends and low points in the pipeline or where otherwise required. The blow-off assembly pipe work and valving shall be appropriately sized and shall conform in all respects to the applicable portions of these Construction Specifications and Standards and shall be installed as per WD_05 – Blow-Off Assembly.

Dead end assembly shall consist of a riser pipe, gate valve, fittings, and valve structure. Pipes shall be Type K Copper with flare.

The blow-off assembly enclosure or chamber shall have a cast iron frame and cover equal to Dewey Brothers Model B-1200. In no instance shall the drain or the outlet be connected to a sanitary sewer. Valve boxes shall be cast iron #2 valve box with truss pipe or C900 as shown in Detail WS_02 – Valve Setting Detail.

The blow-off assembly shall not be installed under pavement subject to vehicular traffic unless a variance is approved by the Director of Public Works.



4.7 HYDRANTS

Hydrants shall be manufactured in accordance with AWWA C502, latest edition, and shall be approved by the National Board of Fire Underwriters. Hydrants shall be AVK Series 27-80 built for the City of Franklin or approved equal.

4.8 METERS, METER BOXES, AND COPPER SETTERS

A. METERS

All services shall be metered to indicate water consumption in thousands of gallons. Each water meter installation shall include corporation stop, pipe saddle, if required, Type K Copper service pipe, meter box, yoke bar and meter. Water Meters shall be 5/8" X 3/4" or 1" with the most up to date Neptune R900 radio read feature or approved equal to be read by radio from the cities current meter reading equipment.

B. METER BOXES

Standard boxes of appropriate size, complete with covers as manufactured by Dewey Brothers, or approved equal, shall be furnished and installed around all yokes and meters. Boxes shall be MBX-1 Type or approved equal capable of installation of remote module by appropriately placed 1 3/4" hole in lid.

C. YOKE BAR SETTERS

Within all meter boxes and on all service connections, yoke setters to fit 5/8" x 3/4" or 1" meters with cutoff valves of sufficient size with flared connections, as manufactured by Ford Meter Box Company, or approved equal, shall be furnished and installed. Backflow preventer shall be provided on each copper setter.

4.9 SERVICE CONNECTIONS

A. GENERAL

All water services and plumbing shall conform to the Uniform Statewide Building Code.

B. SERVICE PIPE

Type K Copper pipe and adapters shall be furnished and installed between the corporation stops and copper setters at locations indicated on the plans and where directed. Service connections larger than two-inches shall be of material approved and directed by the City.

C. SERVICE INSTALLATION

One meter box and copper setter shall be installed on each service connection at the locations indicated and in accordance with all applicable plans and specifications. Where condition warrant and as directed, the service connections shall be jacked in place by an approved method. Otherwise, service connections shall be open cut. In no case shall two service pipes be installed in the same trench. Meters shall be delivered to the Department of Public Utilities.

SECTION 5 – TESTS AND DISINFECTION

5.1 TESTS

The Owner/Developer shall notify the City at least 48-hours prior to scheduling testing. Tests shall be made on all sections of pipe throughout the entire project and shall be conducted only in the presence of an authorized City representative or agent. Tests shall be made after the corporation stops have been installed. Tests shall be made between adjacent valves. Care shall be taken to insure that the entire test run of pipe is securely braced and blocked against thrust when pressure is applied. All thrust blocks must be completely set and approved. All pipes must be firmly supported and weighted down by partial backfill soil on top.

All water for testing purposes shall be potable water and procured and paid for by the Owner/Developer. Prior to testing, the pipe shall be filled slowly and carefully with water from the nearest practical source with all air expelled from hydrants, high points and service locations.

Under normal atmospheric pressure the pipe shall be allowed to soak for a minimum period of 24 hours. All entrapped air remaining at this time shall be expelled. The Owner/Developer shall provide all the apparatus or other accessories necessary to conduct the tests. No more than 2,000 feet of line shall be tested at one time.

The completed piping shall be subjected to a hydrostatic pressure of 150 psi. This pressure shall be maintained for two hours. Leakage shall not exceed the amount given by Table 6 AWWA C600, latest edition.

All pipe, joints, valves and fittings in the test section shall be examined. Defective material disclosed as consequence of the tests shall be removed and replaced by sound material at the Owner/Developer's expense. Any joint showing visible leakage shall be made airtight. The test shall be repeated until its results are satisfactory to the authorized City representative or agent.

5.2 DISINFECTION

During the course of work, all reasonable precautions shall be taken to protect the pipe interiors, fittings and valves against contamination. When pipe installation is not in progress, all openings in the water main shall be closed by watertight plugs.

The water pipe shall be closed and flushed prior to disinfection with a sufficient flow to produce a flushing velocity of at least 2.5 feet per second. Potable water shall be flushed through the system until no traces of foreign matter are visible. This water shall be discharged or wasted only at points specifically designated by the authorized City representative or agent.

The new water pipe shall be disinfected by chlorination in accordance with AWWA C651, latest edition. The disinfection agent of the chlorine solution shall be sodium hypochlorite solution, Grade D, conforming to Federal Specification O-S-602b, dry hypochlorite equal to “HTH” as manufactured by Olin Chemical Co., or liquid chlorine. Liquid chlorine shall be used only when suitable equipment is available and only under the direct supervision of a properly trained and equipped specialist approved by the City.

The chlorine solution at any point in the pipe, shall have a minimum concentration of 50 parts per million (ppm) or 50 milligrams per liter (mg/l) and shall be applied to the system at a constant, measured rate by pumping in accordance with the continuous feed method, AWWA C651, Sub-section 5.2, latest edition. Potable water from an approved source shall be made to flow at a constant, measured rate into the new pipe. The two rates shall be properly proportioned so that the chlorine concentration in the pipe is maintained at a minimum of 50 ppm available chlorine.

Chlorine application shall not cease until the entire pipe is completely filled with solution. The chlorinated water shall be retained in the system for at least 24 hours, during which time all valves hydrants shall be operated in order to disinfect the appurtenances. At the end of the 24-hour period, the water shall contain not less than 25 parts per million chlorine throughout the entire pipe system disinfected. After the specified retention period, the chlorinated water shall be flushed from the main until the residual chlorine concentration is no higher than that prevailing in the existing system to be determined by the City of Franklin agent. The chlorine residual determinations must be made using only approved methods.

After at least 16 hours following final flushing and before the water main is placed in service, samples of water from several designated points, not to exceed 2,000 feet, in the system shall be collected in sterile containers treated with sodium thiosulfate. No hose or fire hydrant shall be used in the collection of samples. Two samples taken 24 hours apart at each selected location shall be submitted to a certified laboratory for analyses and the results of these analyses reported to the City of Franklin Department of Public Works. If the examination indicates the presence of coliform organisms, the entire disinfection process shall be repeated or continued until the examination indicates the absence of such pollution. Standard plate counts may be required on retest.



Pipe taps and fittings used at connections to the existing system shall be thoroughly disinfected before installation. Excavation for such connections shall be kept free from water until the connection is completed, and extreme care shall be exercised to prevent contamination of the pipe and connection fittings. The inside of the existing pipe within 3 feet of the point of connection shall be disinfected by spraying with a solution containing not less than 200 ppm of chlorine immediately before connection is made. If at any time the water in the existing piping becomes contaminated, this piping shall be disinfected as specified for new piping, back to the nearest gate valve or valves, or beyond those points as necessary to include all contaminated piping.

The complete disinfection process and method followed, especially if materially different from those specified, shall be in accordance with the directives of the Virginia Department of Health, and all methods employed shall meet with its approval. Final approval of the bacterial examination shall be received from the City of Franklin Department of Public Works prior to placing the new water main into operation.

SECTION 6 – CROSS CONNECTION CONTROL

6.1 GENERAL

- A. A complete reference outlining all cross connection device requirements/policies is listed in the Franklin City Ordinance. A copy of this document is available from the Department of Public Works.

6.2 BACKFLOW PREVENTION DEVICE REQUIREMENTS

- A. Categories of devices which shall be used to prevent the possibility of a cross connection are:
 - (1) Air Gap
 - (2) Reduced Pressure Zone Backflow Prevention Assembly
 - (3) Double Check Valve Backflow Assembly
 - (4) Pressure Vacuum Breaker Backflow Preventer
 - (5) Atmospheric Vacuum Breaker Backflow Preventer

- B. All devices used must be approved for use as backflow prevention devices by the following:
 - (1) American Society of Sanitary Engineers (ASSE)
 - (2) American Water Works Association (AWWA)
 - (3) American Standards Institute (ANSI)
 - (4) University of Southern California Foundation for Cross Connection Control.

PART 4 - PUBLIC SANITARY SEWERAGE FACILITIES

SECTION 1 – GENERAL REQUIREMENTS

1.1 GENERAL

- A. All installations shall be in strict accordance with the – Sewage Regulations – SR, latest edition, and the City of Franklin “Construction Specifications and Standards for Sanitary Sewerage Facilities.”
- B. No deviation from the Construction Specifications and Standards approved by the City shall be allowed, unless specifically authorized in writing by the Director of Public Works or designee.
- C. In accordance with the SR, all sewers shall be designed by Professional Engineers licensed by the Commonwealth of Virginia.
- D. Sewers shall be designed and constructed to achieve total containment. Sewers shall be designed for the estimated ultimate tributary population with an upper limit consisting of the 50-year population growth projection expected when considering parts of the sewer that can be readily increased in capacity.
- E. Sewers shall remain fully operational during 25-year flood/wave action. Sewerage facilities and their appurtenances located along streams shall be protected against the normal range of high and low water conditions, including the 100-year flood/wave action.
- F. Although constructed as parcels or sub-systems, all sewers and related facilities of all proposed Owners/Developers shall be approved on the basis of their functional integration with the City’s total sanitary sewer system.
- G. The Owner/Developer shall obtain all permits for construction and operation of all proposed sanitary sewerage facilities. These Construction Specifications and Standards shall apply to sanitary sewers only. Combined sanitary storm sewers shall not be permitted in the City of Franklin.

1.2 DESIGN FACTORS

In determining the required capacities of sanitary sewers, the following factors shall be considered:

- A. Maximum hourly sewage flow.
- B. Additional maximum sewage or waste flow from industrial plants.
- C. Ground water infiltration.

- D. Topography of area.
- E. Location of waste treatment plant.
- F. Depth of excavation.
- G. Pumping requirements.

1.3 DESIGN BASIS

A. PER CAPITA FLOW

New Sewer systems shall be designed on the basis of an average daily per capita flow of sewerage of not less than that set forth in the SR. These figures are assumed to cover infiltration. When deviations from the foregoing per capita rates are proposed, a description of the procedure used for sewer design shall be included with the submission.

B. PEAK FLOW – LATERAL AND SUB-MAIN SEWERS

1. Lateral. A sewer that has no other sewers discharging into it.
2. Sub-main. A sewer that receives flow from one or more lateral sewer pipes.

Minimum peak design flow should be 250 percent of the average design flow. When deviations from the foregoing minimum peak design flow rates are proposed, a description of the procedure used for sewer design shall be included with the submission.

C. PEAK FLOW – MAIN, TRUNK AND INTERCEPTOR SEWERS

1. Main or Trunk. A sewer that receives sewage flow from more than one sub-main sewer.
2. Interceptor. A sewer that receives sewage flow from a number of sub-main, trunk, and sewage force mains.

Minimum Peak Design Flow should be 250 percent of the average design flow. When deviations from the foregoing minimum peak design flow rates are proposed, a description of the procedure used for sewer design shall be included with the submission.



1.4 MINIMUM SIZES, SLOPES AND VELOCITY

A. SIZES

The minimum size of gravity sewer shall be eight inches interior diameter, except for service laterals, which may be four inches interior diameter.

The minimum size of sewage force main shall be four (4”) inches interior diameter except where such force mains follow grinder pumps.

B. SLOPES AND VELOCITIES

All gravity sewers shall be designed and constructed with uniform slope between manholes and to give mean velocities when flowing full, of not less than two feet per second, based on Manning’s Formula using an “n” value of 0.013. The following are minimum slopes, which shall be provided, however, slopes greater than these are desirable.

Minimum Size (Inches)	6	8	10	12	18	24
Minimum Slope (Ft./100Ft.)	0.46	0.40	0.28	0.22	0.12	0.08

For sewage force mains at pumping capacity, a minimum self-scouring velocity of two feet per second shall be maintained, unless flushing facilities are provided. A velocity of eight feet per second shall not be exceeded.

Gravity sewers and sewage force mains on 20 percent slope or greater shall be anchored securely with concrete anchors or approved equal. Minimum anchorage shall be as follows: (a) not over 36 feet center to center on grades from 20 percent to 35 percent; (b) not over 24 feet center to center on grades from 35 percent to 50 percent; and, not over 6 feet center to center on grades exceeding 50 percent.

1.5 MINIMUM COVER

All gravity sewers and sewage force mains shall be provided with a minimum cover of not less than thirty-six inches of earth, measured from established finished grades to the top of the pipe.

Any sewer having less than three feet or more than twelve feet of cover from finished grade to the top of the pipe shall be constructed of ductile iron, Special Thickness Class 50 pipe.



1.6 MANHOLE AND CLEANOUT LOCATIONS

A manhole shall be constructed at every change in alignment, grade of pipe size. The maximum distance between manholes shall be 300 feet. A cleanout shall be constructed at the end of every lateral. All sewers shall terminate with a manhole.

1.7 LOCATION OF SEWERS

As a general rule, sewers shall be placed in the right-of-way at a location deemed most suitable by the City for proper construction. Upon approval by the Director of Public Works, sewers may be constructed on private property if it is the only feasible way to serve isolated properties, low lots, or to make necessary connection to another sewer. In this case a utility easement of not less than twenty (20) feet shall be provided for all sewers on private property. For interceptors, the easement shall be twenty (20) feet with suitable width construction easements provided. The Director of Public Works may require a wider easement depending on the depth of the line.

Separation of sewers and water mains shall adhere to the conditions of Section 1.4 of the City's "Construction Specifications and standards for Public Water Facilities". No sewer may be located within 50 feet of a drinking water well. In addition to the required 50-foot separation, any sewer installed between 50 and 100 feet of the well shall be constructed of AWWA-approved water pipe and no manholes can be located within 100 feet of these wells.

SECTION 2 – CONSTRUCTION SPECIFICATIONS

2.1 GENERAL PROCEDURES

Construction of all sanitary sewers and appurtenances in the City of Franklin shall be in accordance with these specifications and standards, unless the Director of Public Works authorizes specific deviation in writing. Building service laterals that remain the responsibility of the owner of the premises shall be constructed in accordance with the BOCA Code. Construction shall also conform to the plans, specification data, and manufacturer cut sheets submitted by the Owner/Developer and approved by the City. The City shall insist that good workmanship and standard sewer construction principles apply in the work so that the finished project may qualify for final inspection and acceptance into the overall City sewerage system.

Prior to the construction of any sanitary sewerage facility, the Owner/Developer shall submit to the City for review and approval 10 sets of all necessary construction plans and specifications.

The Owner/Developer shall have a licensed land surveyor in the Commonwealth of Virginia place adequate line and grade stakes and shall set stakes and furnish grades so that all manhole frames and covers can be set to finished grade.



Suitable profile sheets must be prepared, in clear and legible manner, giving all necessary construction data. Before allowing any construction to proceed, the City shall review and approve plans and specifications submitted by the Owner/Developer.

All pipes shall be installed in accordance with the manufacturer's recommendations as approved by the City. No pipe shall be installed in water, or when, in the opinion of the City, trench conditions are unsuitable.

If any deviation is contemplated in location, alignment, or grade of any sewer, masonry structure, or accessory from that shown on the plans approved by the City, details of the proposed deviation shall be submitted to the City for review and approval before the changes are constructed.

At all times during construction, a complete set of approved construction plans must remain on site. Said plans must bear the City of Franklin Public Works approved seal and signature.

2.2 INSTALLATION

A. EXCAVATION

Excavation of whatever substance encountered shall be performed to the dimensions and depths specified or shown on the Owner/Developers approved plans. Ledge rock, boulders, and large stones shall be removed to provide a clearance of at least six inches below and on each side of all pipe and fittings for pipes 24-inches in diameter or less, and 9-inches for pipes larger than 24-inches. The specified minimum clearances are the minimum clear distances, which will be permitted between any part, projection, or point of such rock, boulder, or stone.

In the event that unstable material is encountered at or below the excavation depth, the City shall be notified. Such materials shall be removed and replaced with suitable materials, which shall be furnished as an ordinary and integral part of excavation and backfill. If excavation of any nature has been made deeper than necessary, then a layer of suitable granular backfill shall be placed to insure a firm foundation for the pipe.

Excavated material shall not interfere with public travel. Rock or other materials undesirable for backfill shall be removed from the construction site and properly disposed of by the Owner/Developer.

B. TRENCHING

The trench shall be dug so that the pipe can be installed to the alignment and depth required and it shall be excavated not more than 100 feet in advance of the complete pipe laying operation. The width of the trench shall be ample to permit the pipe to be installed and jointed properly and the backfill to be placed and thoroughly compacted in accordance with the plans and specifications. Trenches

shall be of such extra width when required as will permit the convenient placing of timber supports, sheeting and bracing, and handling of special fittings. In no case shall the pipe bells be used to support the body of the pipe.

Sheeting, shoring, or bracing shall be used where necessary to prevent possible injury to workmen, existing and new structures, pipes, and any other public or private property. The Owner/Developer will be held accountable and responsible for the sufficiency of all sheeting and bracing used and for all damage to persons resulting from the improper quality, strength, placing, maintaining or removing of the same. The City's permission to proceed with work in either a sheeted, shored, braced or open trench condition shall in no way relieve the Owner/Developer from any liability. When the material to be excavated is of such character or other conditions are such as to render it necessary, the sheeting shall be closely driven to such depth below the bottom of the structure or pipe as may be required.

C. DRAINAGE

Grading shall be controlled in the vicinity of excavations so that the surface of the ground will be properly sloped to prevent water from running into trenches or other excavated areas. Any water, which accumulates in the excavations, shall be removed promptly in such manner as to not create a nuisance to adjacent property or public thoroughfare. Trenches shall be kept dry while pipe is being installed.

D. PIPE INSTALLATION

Pipes shall be unloaded, and stored to avoid interference with traffic and trenching operation. The pipe shall be handled by mechanical equipment.

Bedding material shall be provided for all pipes in accordance with Detail EW_01. Continuous and uniform bedding shall be provided in the trench for all buried pipe so that the pipe barrel bears on and is supported at every point between bell holes. Trenching below the specified grade shall be backfilled with approved granular material and thoroughly compacted. The finished sub-grade shall be prepared accurately by means of hand tools. Where excavation is made in rock or boulders the sub-grade shall be made by backfilling with stone or clean selected soil, which shall be thoroughly compacted. No pipe shall be installed upon a foundation in which frost exists or at any time that there is danger of the formation of ice or penetration of frost at the bottom of the excavation.

When installing pipe in the trench, proper implements, tools, and facilities satisfactory to the City and as recommended by the material manufacturer shall be provided and used by the Owner/Developer for the safe and convenient prosecution of the work. All pipe, fittings and accessories shall be carefully lowered into the trench piece by piece by means of a derrick, ropes, slings or other suitable tools or equipment in such a manner as to prevent damage to the

materials and any protective coating and linings. Under no circumstances shall such materials be dropped or dumped into the trench.

The pipe may be constructed in a manner best adapted to securing good installation results, however, the method of pipe laying and jointing shall be in accordance with the manufacturer's recommendations and shall be approved by the City. Damaged or unsound pipe or fittings shall not be accepted. Gravity sewer 24-inches or less shall be constructed with straight alignment between manholes.

Rubber gasket, "O" ring type joint pipe shall be installed true to line and grade and shall be jointed together such that the completed pipe will have a straight vertical and sloped horizontal alignment. After placing a length of pipe in the trench the spigot end shall be centered in the open bell of the pipe previously installed and the joint completed in accordance with the pipe manufacturer's instruction manual. Then trench pipe interface shall be shaped to the curvature of both the bell and barrel of the pipe. The trench shall be kept free of water while the work is in progress. The ends of the pipe shall be brushed clean so that proper joint can be made. As work progresses the interior of the pipe shall be cleared of dirt, cement, or other superfluous material. The exposed end of all pipes shall be fully closed to prevent earth, water, or other substances from entering the pipe at all times. Should dirt or other materials enter the previously installed pipe, the pipe shall be immediately cleaned with care taken to preserve any coatings. Gravity sewer pipe shall be installed on standard bedding in accordance with Detail EW_01. Where mechanical joints are specified for ductile iron pipe and fittings, the joint shall be thoroughly coated with lubricant, the gasket and gland properly positioned, bolts inserted and diametrically opposite bolts drawn up until all bolts are tight. All bolts shall be tightened with a torque wrench set at 55 foot-pounds.

Pipe cutting shall be accomplished with a mechanical cutter or a saw in a manner that will not damage the pipe. Ends of cut pipe shall be beveled to prevent damage to gaskets or fittings.

The method of thrust restraint required for mains is the use of Mega Lug type restraint system or approved equal.

Materials for roadway, alleys, or driveways shall be compacted to at least 95 percent of the maximum density.

The site restoration of the entire construction area shall be finished in a neat and uniform condition acceptable to the City.

E. BACKFILL

Clean earth, sand, gravel, or other materials approved by the City shall be used for backfill material. Setting the backfill with water will be permissible and will be a requirement, when so directed by the City. Material suitable for backfill

shall be selected, deposited, and compacted to eliminate the possibility of lateral displacement of the pipe. Backfill material containing pieces no greater than one inch shall be evenly and carefully placed around and over the pipe and shall be solidly hand tamped around the pipe in 6-inch layers up to a level two feet above the top of the pipe. Backfilling shall be carried out simultaneously on both sides of the pipe.

The remainder of the backfill shall be deposited and compacted by mechanical tampers except in areas where paving is to be placed over the backfilled trench. In these areas, the backfill shall consist of mechanically compacted materials as directed by the City. Compaction shall achieve a density of at least 95 percent of the maximum density. Compaction test, at the Owner/Developer expense, may be required to determine if proper compaction has been obtained.

Backfilling shall follow immediately after construction of the sewer pipe and appurtenances and in no case shall there be any installed pipe left uncovered at the end of the day.

Any trench improperly backfilled or where settlement occurs shall be reopened to the depth required for proper compaction, then refilled and compacted with the surface restored to the required grade, compacted, mounded over, and smoothed off.

2.3 MANHOLES, CLEANOUTS AND ACCESSORIES

A. MANHOLES

1. General. All manhole frames and covers shall be set to finished grade, in accordance with the approved plans, from the grade stakes furnished by the Owner/Developer's certified licensed land surveyor in the Commonwealth of Virginia.
2. Cast In Place. Cast in place manholes will only be used where a precast manhole cannot be used. Brick shall be clean and new and shall conform to ASTM Specification C-55. Bricks shall be wetted shortly before laying. They shall be laid in full mortar bed and shoved in place so that joints are completely filled. Joints shall be 3/8 inch thick. Mortar for brick work shall consist of one part Portland cement and two parts clean, dry sand with an admixture of twenty pounds of hydrated lime for each bag of cement. The manholes shall be plastered with 1/2 inch of mortar over the exterior and interior surfaces.

Unless otherwise specified two coats of Bitumastic No.300M as manufactured by Koppers or approved equal shall be applied on the interior and exterior side of the brick manholes. Holes for the required sewers shall include flexible connections comprised of rubber boots and stainless steel straps, similar to Kor-N-Seal, Interpace, or approved equal.

All manholes shall have an extended concrete base slab constructed of Class A3 reinforced concrete with a minimum compressive strength of 3000 psi at 28 days and shall be in accordance with Section 4. The base slab shall be a minimum of 8-inches thick and have a minimum outside diameter of 5-feet and 10-inches. Manholes, 12-feet or deeper, must have a 12-inch thick base slab.

Base slabs must be placed on a minimum of 8-inches of stone or other approved material.

Invert channels shall be constructed in all manholes. Invert channels shall be smooth and semicircular and shall conform to the inside of the adjacent sewer section. Changes in channel size shall be gradual. The floor of the manhole outside the invert elevation shall be smooth and shall slope toward the channel at one to two inches per foot.

Manholes that receive a force main shall do so with the force main pipe centerline horizontal with an invert elevation, which will ensure a smooth flow transition to the gravity section. In no case shall the force main enter the manhole more than one foot above the flow line. See Detail SS_17.

3. Precast Concrete Manholes. Precast concrete manholes shall be of the extended base type and shall be constructed in accordance with these specifications and standards and in conformance with the approved plans. The walls of the manholes shall have a minimum thickness of 5 inches and be constructed of Class A4 reinforced concrete with a minimum compressive strength of 4000psi at 28 days and shall be manufactured in accordance with ASTM Designation C-478. Manhole sections shall be tongue and groove and shall be joined with butyl resin joint sealer.

The lowest manhole section shall be placed in the precast base slab in such a manner to provide the greatest amount of bond and prevent infiltration and ex-filtration. Insert holes for the required sewers shall be made in the manhole sections during the manufacturing operation and shall include flexible connection comprised of rubber boots and stainless steel straps, similar to Kor-N-Seal, Interpace, or approved equal.

The manhole invert elevations shall be shaped and finished during the construction of the bottom slab in accordance with the same specification for brick manholes.

Manholes shall be carefully made and shall have no honeycombs or other deteriorated surfaces. All surfaces shall be smooth. All lifting holes shall be filled flush with an approved mortar upon completion of setting. Standard manhole steps shall be polypropylene coated smooth steel rod as indicated in Sub-section 4.3.D of Part 5, or approved equal, and shall be securely placed in position in the manhole section during the manufacturing of the section. The uppermost section of the precast manhole shall be tapered to a minimum

interior diameter of two feet as indicated in the standard details. The inside diameter of the manhole shall be no less than 48 inches. The intermediate straight sections shall be either three or four feet in length. The length of the lower sections shall be three times the wall section, and in no case shall it be less than two feet. The bottom section shall be placed on a minimum of 6 inches of gravel or other approved material, as shown in Detail SS_01 or SS_02.

4. Drop Pipe Connections. A drop pipe shall be provided for a sewer entering a manhole at an elevation of 12 inches or more above the manhole invert elevation or as may otherwise be required to conform to the use of standard fittings in the dropping construction.
5. Frames and Covers. Frames and covers shall be Capital Foundry MH-1-ST labeled SEWER or approved equal. All frames shall be securely anchored to the related structures and shall be installed so that the cover shall be exposed and flush with the street surface. If street surfaces are renewed or replaced by the Owner/Developer after the sewer system has been approved and accepted by the City, but while such streets are still the obligation of the Owner/Developer the frames and covers therein shall be readjusted to proper location, without the use of riser rings, relative to new street surfacing. The frame and cover of manholes or clean outs located in sodded or other off-street areas shall be so installed that the covers shall be exposed and either flush or above the immediate surface as deemed advisable by the City, as shown on Detail SS_11.
6. Connecting to Existing Manholes. Pipe connections to existing manholes shall be core bored with an inserted boot in such a manner that the finished work will conform as nearly as practical to the essential, applicable requirements for new manholes, including all necessary concrete work, cutting and sloping. Line connections to the manhole or to short stubs integral with the manhole shall be made with flexible joints. Flexible joints are joints, which permit the manhole to settle without destroying the watertight integrity of the sewer connections.

B. ACCESSORIES

Air relief valves shall be constructed at the necessary high points in force mains to relieve air locking, as deemed necessary by the City and as indicated in the Detail WS_03.

2.4 SPECIAL CROSSING

A. STREAM CROSSINGS

Where stream crossings are required in sewer construction, the pipe shall be ductile iron, mechanical joint pipe of the same size interior diameter as the pertinent sewer, or the next larger in ductile iron if an equal size is not available.



A minimum of one foot of cover over the crown of the sewer shall be provided where the natural bottom of the stream is rock and three feet of cover where the bottom is other material.

All stream crossings shall be installed in accordance with the recommendations of the City and the approved plans for the construction project. Stream crossings must be tested in place and show zero leakage. Provisions for such test shall be incorporated in the design.

B. HIGHWAY AND RAILROAD CROSSINGS

Where required, crossings under highways shall be installed in accordance with the requirements of the VDOT. Crossings of railroads shall be installed in accordance with the requirements of the Railroad Company. Encased crossings shall be accomplished prior to the construction of adjacent sections of the project. Safety precautions will be required while performing the crossing work.

Horizontal auger boring and jacking of pipe or tunneling under pavement shall be done only upon prior written approval by the City. The Owner/Developer shall submit a detailed schedule of operation indicating the exact method and equipment to be used. Only workmen skilled in this class of work shall be employed.

Casing pipe or tunnel liner, as required, shall be installed beneath the roadbed. If obstructions require relocation of the casing, the unfinished cavity shall be filled with 2500 psi concrete pneumatically grouted in place.

Casing pipe required for bored installations shall be uncoated steel with minimum 3/8-inch walls and 36,000 psi yield strength. Casing pipe sections shall be continuously welded at joints as the casing is advanced.

The sewer shall be installed in the casing with proper care exercised to insure that the pipe sections remain completely joined. Force mains shall have restrained joints. Upon completion and testing of the sewer pipe, the ends of the casing shall be closed as directed by the Authorized City Representative or Agent.

2.5 SERVICE CONNECTIONS

Service pipe between the sewer main and the property line shall conform to the applicable sections of these specifications and standards and in no case shall be less than four inches inside diameter. All pipes from the sewer main to the cleanout shall be installed to a grade of not less than 1/4 inch per foot.

All connections and wyes, which are for future use, shall be capped as directed by the City. No pipe shall be cut for service connections except as approved by the City. The ends of pipe, which enter sewers, shall be neatly cut to fit the inner face of the pipe. When directed, such cutting shall be done before the pipes are built in. A maximum of



four (4) service connections can be installed in any manhole. They must be spaced one foot (1') center to center around the manhole, and staggered vertically. Wyes and service connections shall be installed where indicated on the approved plans. Wyes and service connections shall be installed in conformance with these Construction Standards. Each service lateral shall terminate at the property line with a standard cleanout as shown on Detail SS_14.

SECTION 3 – CONSTRUCTION STANDARDS

3.1 GENERAL REQUIREMENTS

The following standards delineated by graphical details shall be applicable to the construction of all sanitary sewerage facilities improvements within the City. Deviations from these standards shall require written approval from the City.

3.2 STANDARD DETAILS

- WS_03 MANUAL AIR VENT ASSEMBLY
- SS_01 STANDARD PRECAST CONCRETE MANHOLEW/EXTENDED
MONOLITHIC BASE
- SS_02 PRECAST CONCRETE SHALLOW MANHOLE
- SS_10 MANHOLE FRAME AND COVER
- SS_11 SANITARY SEWER SERVICE CLEANOUT FRAME AND COVER
- SS_14 SANITARY SEWER SERVICE CONNECTION
- SS_17 SAXOPHONE CONNECTION

SECTION 4 – MATERIALS

4.1 GENERAL

Pipe size, type, joint and class shall be designated on the plans. Unless otherwise approved in writing by the City, or as specifically indicated on the plans approved by the City, all pipe, fittings, and accessories shall be as delineated in this section.

All pipe used for sewage force mains shall be of the pressure type with pressure type joints.

4.2 SEWAGE PIPE

Ductile iron pipe shall be used at depths of 10' and greater. All pipes shall be one of the following:

A. DUCTILE IRON PIPE

Ductile iron pipe shall be centrifugally cast and manufactured in accordance with ANSI/AWWA C151/A21.51. Ductile iron pipe for gravity sewers shall be coated inside and outside with a bituminous material of either coal tar or asphalt base in accordance with ANSI/AWWA C151/A21.51, Section 51.8.1 ad 51.8.3,

latest edition. Ductile iron pipe for force mains shall be cement-mortar lined in accordance with ANSI/AWWA C104/A21.4, latest edition. Cement for the mortar shall be Type II Portland Cement. The standard seal coat of bituminous material shall be applied over the cement lining. The standard exterior coating of bituminous material shall be applied to both gravity sewer pipe and force main sewer pipe.

Mechanical joints and push-on joints shall be manufactured in accordance with ANSI/AWWA C110/A21.1, latest edition. Mechanical joints shall be used for the connection of all fittings and valves. The pipe manufacturer in accordance with ANSI/AWWA C111/A21.11, latest edition, shall furnish gaskets. Ductile iron pipe with flanged joints shall be manufactured in accordance with ANSI/AWWA C115/A21.15, latest edition.

Fittings shall be manufactured in accordance with ANSI/AWWA C110/A21.10, latest edition. Compact fittings manufactured in accordance with AWWA C153 may be utilized up to the sizes approved. All fittings shall be cement-mortar lined inside in accordance with ANSI/AWWA C104/A21.4, latest edition. The coatings of the fittings shall be as specified for the pipe. Compact ductile iron fittings for use with pipe 16 inches and smaller manufactured in accordance with AWWA C153.

B. POLYVINYLCHLORIDE PIPE – PVC

PVC Pipe for gravity sewers 8 to 30 inches in diameter shall be manufactured in accordance with ASTM D3034 and shall meet the requirements for SDR 26. Joints shall consist of an integral wall section with a solid cross section rubber gasket conforming to ASTM F-477. Minimum “Pipe Stiffness (F/Y) at 5 percent deflection shall be 46 psi when tested in accordance with ASTM D-2412. The maximum allowable deflection shall be 5 percent after backfill has reached 95 percent compaction.

PVC pipe for force mains shall not be allowed.

C. IDENTIFICATION OF PVC PIPES

A detectable tape identifying PVC force main pipe with words “CAUTION: SEWER LINE BURIED BELOW” shall be installed 6 to 12 inches above the pipe in addition to a 23 gauge copper wire attached to the top of the pipe for purposes of positive identification and location. The tape shall be Terra Tape D (Green) as manufactured by Griffolyn Co., or approved equal.



4.3 MANHOLES, CLEANOUTS, AND ACCESSORIES

A. PRECAST CONCRETE MANHOLES

The walls of the manholes shall have a minimum thickness of 5 inches and shall be constructed of reinforced concrete with a compressive strength of 4000 psi at 28 days in accordance with Section 2.3-A2 of these specifications, Part 5. Joint sealer shall be Butyl Resin or Approved equal.

B. CLEANOUTS

Cleanouts shall be manufactured and installed as indicated on Detail SS_14 for laterals.

C. CONCRETE

Structural concrete shall be used for the construction of foundation slabs and special structures. Cast in place concrete shall be in accordance with VDOT General Class A3.

D. FRAMES, COVERS, AND STEPS

Standard frames and covers and steps shall be furnished and installed at all locations indicated of the plans. Frames and covers shall be ASTM Designation A48, latest edition and shall be Capital Foundry MH-1-ST, or approved equal. Castings shall be true to pattern in form and dimensions, free from pouring faults, sponginess, cracks, blow-holes, and other defects effecting their strength for the use intended. Castings shall be boldly filleted on angles and the rises shall be sharp and perfect. Castings shall be sand blast cleaned so as to present a smooth, clean and uniform surface. Castings shall receive one coat of black asphaltum paint prior to delivery to the job site. Steps shall be polypropylene coated smooth steel rod, Type PS-2 as manufactured by M.A. Industries, Inc., or approved equal. Steps shall be installed where indicated on plans. Watertight manhole covers are to be used whenever the tops may be subject to flooding. At a minimum, solid, gasketed, watertight covers shall be used to the elevation of the 25 year flood/wave action.

E. GATE VALVES

Gate valves shall be iron body; bronze mounted, resilient seat with non-rising stems, and 2" operating nut in accordance with ANSI/AWWA C500, latest edition, as manufactured by American AVK Co., or approved equal. Gate valves shall open left. Gate valves shall be installed at 2,000 foot maximum spacing along force main pipe or as needed and approved by the City.



F. AIR RELEASE VALVES

Air release valve assemblies shall be manufactured as indicated on Detail WS_03.

SECTION 5 – FIELD TESTS

5.1 GRAVITY SEWERS

A. GENERAL

The Owner/Developer shall give at least 48 hours notice to the City prior to the commencement of testing. The Owner/Developer shall conduct infiltration, ex-filtration, and /or air tests as directed by the Authorized City Representative or Agent. Tests shall be performed on each completed segment of the sewer, not to exceed three hundred feet in length. The Owner/Developer shall furnish all labor, equipment and material for the tests. Tests shall be conducted only in the presence of an Authorized City Representative or Agent.

Leakage into the sewer shall not exceed 50 gallons per inch of nominal diameter per day per mile for any section including manholes. In the event that leakage exceeds the stated allowance in any section tested, the Owner/Developer shall make such repairs to the line, manholes or appurtenances as may be necessary to comply with the leakage allowance and to satisfy the City

B. INFILTRATION TEST

The Owner/Developer shall thoroughly saturate the trench or excavation with water, after placement of backfill and shall carefully measure the flow of water at the nearest downgrade manhole. Three series of measurements shall be made at no less than one hour intervals and the results shall be reduced to an average infiltration rate, and then applied to the 24-hour period. The infiltration test shall be allowed only when it can be proven that the hydrostatic head outside the pipe is a minimum of four feet above the pipe for the entire test length.

C. EXFILTRATION TEST

The Owner/Developer shall plug the inlet to the lower manhole and shall fill the pipe at the upper manhole with water. Exfiltration shall be determined by measuring the amount of water added to keep the upper manhole filled to a depth of four feet above the crown of the pipe or the top of the manhole, whichever is the lesser. All manholes shall be tested in a similar manner.

D. AIR TEST

The Owner/Developer shall plug the pipe and shall conduct a low-pressure air test to determine the acceptability of the completed work. The air testing equipment shall be Air-Lock, as manufactured by Cherne Industrial,

Incorporated, or approved equal. All air used shall pass through a single control panel. Individual air hoses shall be used from control panel to pneumatic plugs, from control panel to sealed line for introducing low pressure air; and, from sealed line to control panel for continually monitoring the air pressure rise in the sealed line. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe tested. The plug shall resist internal test pressures without requiring external bracing or blocking. Plugs shall be tested prior to installation in the pipe run. A joint of pipe shall be sealed at both ends with the plugs at 25 psig. The sealed pipe shall then be pressurized to 5 psig. The plugs shall withstand this pressure without bracing or movement.

The tested pneumatic plugs shall be placed in the pipe at each manhole and inflated to 25 psig. Low-pressure air shall be introduced into this sealed pipe until a pressure of 4 psig plus the pressure of the ground water over the pipe is registered. This pressure shall stabilize for two minutes. After stabilization to a minimum pressure of 3.5 psig (plus water pressure, if any), the air hose from the control panel to the air supply shall be disconnected. The portion of sewer tested shall be deemed acceptable if the time required for the pressure to fall one pound is not less than that shown in the following tabulation for the respective pipe sizes where sections of pipe between adjacent manholes up to 300 feet in length are tested. The test shall be conducted in accordance with the most recent ASTM Standard test method for low-pressure air test with the following results.

Pipe Diameter (Inches)	4	6	8	10	12
Time (Minutes)	2	3	5	6	7½

E. DEFLECTION TEST

Installation of PVC pipe for main line pipes will require a deflection test to assure that pipe has not exceeded a deflection of 5% of its base inside diameter. Tests shall be performed no sooner than 30 days after completion of backfill. The City, at its option, may require a second test within the guarantee period of the project. A nine arm mandrel and proving ring, as manufactured by Wortco, Inc., or an approved equal, will be sized a 5% less than the ASTM dimension for the pipe and in accordance with the following table:

Nom. Dia.	L	SDR26	
		ASTM D 3034 D	ASTM D 2680 D
8"	8"	7.11"	7.40"
10"	10"	8.87"	9.31"
12"	12"	10.55"	11.22"
15"	15"	12.9"	14.09"



L= Mandrel Arm Length
 D = I.D. of Proving Ring

The mandrel shall be manually pulled, from manhole to manhole, through the entire length of mainline pipe. All pipes that fail the deflection test shall be removed, replaced and retested at no additional expense to the City. Upon successful completion of the initial test, the mandrel, proving ring, and carrying case shall become the property of the City.

F. MANHOLES

Precast concrete manholes may be tested by exfiltration or vacuum.

1. EXFILTRATION

Inflatable stoppers shall be used to plug all pipes into and out of the manhole to be tested. The stoppers shall be positioned in the piped far enough from the manhole to ensure testing of those portions of the pipes not air tested. The manhole shall be filled with water to the top to ensure testing of the entire manhole. A 12-hour soak shall be allowed, after which leakage shall not exceed ¼ gallons per hour.

G. VACUUM

Vacuum testing may be utilized after installation but prior to backfilling around the manhole. Inflatable stoppers and manhole boots shall be secured to prevent movement during the test procedure. Vacuum equipment and indication devices and the method of test procedure shall be approved by the Virginia Department of Health.

After cleaning of the manhole and installation of all stoppers, a vacuum of 10 inches of mercury shall be established in the manhole. The manhole shall be considered to have passed the vacuum test if the time required for the vacuum to rise 9 inches of mercury for a four foot diameter manhole is not recorded at less than the following elapsed time.

<u>MANHOLE DEPTH</u>	<u>TIME (SECONDS)</u>
10 ft. or less	60
10 ft. but less than 15 ft.	75
15 ft. but less than 25 ft.	90

Where manholes five feet in diameter are tested, 15 additional seconds shall be added to each elapsed time and where manhole six feet in diameter are tested, 30 additional seconds shall be added to each elapsed time.

If the loss of vacuum is in excess of the allowable limits, the Contractor shall make all necessary repairs and shall repeat the vacuum test until the manhole passes the test. Should the joint mastic be pulled out during the test, the manhole must be disassembled and the mastic replaced. If the Contractor is unable to satisfactorily anchor the stoppers or boots, or is unable to secure a vacuum test, the water filtration test described in 5.2.1 shall be utilized.

5.2 SEWAGE FORCE MAINS

A. GENERAL

The completed piping shall be subjected to a hydrostatic pressure of 150 psi. This pressure shall be maintained for two hours. All pipe, joints, valves and fittings in the test section shall be examined.

Defective material disclosed as a consequence of the tests shall be removed and replaced with sound material at the Owner/Developer's expense. Any leakage shall be corrected. The test shall be repeated until its results are satisfactory to the Authorized City Representative or Agent.

Procedures as outlined in Sub-Section 5.1 of the City's "Construction Specifications and Standards for Public Water Facilities" shall be adhered to in testing the force main pipe. Allowable leakage shall not exceed limits set in AWWA Standard C611, Table 6, latest edition.

B. ANCHORAGE

Force main pipe shall be sufficiently anchored within the pump station and throughout the pipe length. The number of bends shall be as few as possible. Mega Lug type restraint system or approved equal shall be provided where restraint is needed.

C. AIR RELEASE VALVES

A manual air release valve shall be placed at the planned high points in the force main to relieve air locking, in accordance with Detail WS_03.

D. SAXOPHONE CONNECTION

The force main pipe shall enter the receiving manhole with its centerline horizontal and with an invert elevation which will ensure a smooth flow transition to the gravity flow section, but in no case shall the force main pipe enter the gravity sewer system at a point more than one foot above the flow line of the receiving manhole. The design shall be in accordance with Detail SS_17.



Attention should be given to the use of inert materials or protective coatings for the receiving manhole to prevent deterioration as a result of hydrogen sulfide or other deleterious chemical compound attack.

SECTION 6 – PUMP STATIONS

6.1 GENERAL REQUIREMENTS

- A. The City of Franklin Department of Public Works has developed a prototypical pump station building and substructure design. Owner/Developers are expected to utilize this design to the greatest extent possible to assure similarity of facilities.
- B. The Owner/Developer shall furnish and perform all work necessary for the construction of the Pump Station, complete and ready for use. All materials used shall be of the best quality and entirely suitable in every respect for the service required.
- C. The Owner/Developer shall employ only Commonwealth of Virginia Registered Engineers with suitable experience for the design.
- D. Only manufactured products with verifiable field operation of a minimum of two years shall be incorporated in the design.
- E. Only Class A Registered Virginia General Contractors with suitable experience shall be considered for the building of the pump station(s) by the Owner /Developer.
- F. The Owner/Developer shall submit an appropriate number of plans and specification, prepared by a Commonwealth of Virginia Registered Engineer, conforming to the City of Franklin Department of Public Works sewage pumping station prototype for review and approval of each pump station proposed. Technical specifications, pump curves, pump cycles, structural design, and hydraulic calculations shall be provided with the pump station plans. Also, The Office of Community Development must review the building plans for any structure built on site.
- G. Pump stations should be located on a lot properly sized for the structure, incoming sewer, emergency connections, and access paved driveway approved by the City. Prior to any final acceptance of the pump station, the developer must provide the Department of Public Works with a copy of the recorded transfer of land, to ensure the property is properly deeded to the City of Franklin.
- H. The station's operational components shall be located above, or adequately protected against, the 100-year flood/wave action. The stations shall be designed to remain fully operational during the 25-year flood/wave action.

- I. All pump stations shall be provided with three pumps. Two pumps shall be installed. The third pump shall be furnished with all appurtenances as directed by the City.
- J. All pump stations shall be required to be suction lift.
- K. At all times during construction, a complete set of approved construction plans must remain on site. Said plan must bear the City of Franklin Public Works approved seal and signature.

6.2 MASONRY

A. GENERAL

Cementitious materials shall be delivered to the site in the manufacturer's standard packages. Immediately upon delivery, all masonry materials shall be stored under weatherproof conditions until used. Masonry units shall be handled with care and stored off the ground. Damaged materials and cement stored for six months or more shall not be used in the work.

Concrete masonry units shall be kept dry at all times and surfaces of constructed masonry not being worked on shall be protected. When rain or snow is imminent or when the work is discontinued, the tops of exposed masonry wall shall be covered with a strong, waterproof well secured in place.

Masonry work shall not be conducted unless a temperature of at least 40 degrees F and rising can be maintained for a period of at least 48 hours after the masonry is installed. No frozen materials or materials containing ice shall be built upon nor used in masonry work.

B. MATERIALS AND PRODUCTS

1. Mortar. Mortar shall conform ASTM C270, Type N and shall consist of masonry cement conforming to ASTM C91, Type H, clean, angular sand conforming to ASTM C144, and, potable water. Mortar for the concrete masonry units shall be plain, standard Flamingo, manufactured by Riverton Line and Stone Company, Medusa manufactured by Medusa Portland Cement, or an approved equal. Where mortars require a lime content, the lime shall be hydrated Mortaseal by U.S. Gypsum Company or approved equal and shall be converted into putty first. Admixtures, including antifreeze admixtures, will not be permitted.
2. Concrete Masonry Units. Concrete masonry units shall be modular size, lightweight concrete blocks made in accordance with ASTM C-90 from Portland Cement conforming to ASTM C150, Type I, and from expanded blast furnace slag coarse and fine aggregate and shall be guaranteed free from any deleterious matter that will stain plaster or corrode metal. All units shall be high-pressure steam cured for 8 hours at a maintained pressure of

120 psi and a temperature of not more than 370 degrees F. There shall be a 3-hour time interval between the forming of the units and the curing process. Steam shall be introduced uniformly to full curing pressure and released uniformly after the full curing period. Solid load bearing block shall be in accordance with ASTM C-145. Concrete brick shall conform to ASTM C-55. Blending of sand or screening in with aggregate during block manufacture is strictly prohibited.

3. Face Brick. Face brick shall be that utilized as standard by the City.
4. Masonry Reinforcement. Masonry wall reinforcement shall be fabricated from cold drawn, No.9 gauge minimum, steel wire conforming to ASTM A-82 forming a truss design, shall be galvanized after fabrication and shall be in accordance with the Building Officials Conference of America, Incorporated (BOCA) Codes. Masonry wall reinforcement shall be manufactured by Duro-Wal or approved equal. In areas where face brick is installed reinforcement shall have integral brick ties.
5. Fabric Flashing. Fabric flashing material for through-wall flashing shall be heavy duty Nervastral Seal-Pruf as manufactured by Rubber and Plastic Compound Company, Inc., or approved equal.

C. INSTALLATION

1. Mixing and Strength of Mortars. Mortar materials shall be mixed by volume in proportions of one part masonry cement to three parts sand in an approved machine mixer for five minutes, consisting of two minutes for mixing dry materials and at least three minutes after adding water.

The addition of water shall be accurately controlled. To produce mortar grout of a consistency required for masonry placing, the amount of water shall be increased with the mixture being stirred continuously to prevent segregation of the aggregate. Mortar for setting bed fills shall be of a consistency that will permit screening and tamping without drawing water to the surface.

Mortar shall be prepared in batches delivered to the point of application and used before the initial set takes place and not longer than 45 minutes after mixing. Re-tempering shall not be permitted.

The minimum compressive strength of two-inch cubes of the resultant mortar shall be 750 psi at 28 days in accordance with ASTM C-270, Type N.

2. Installation. All masonry shall be installed plumb, true to line with level and accurately spaced courses, with corners plumb and true, and with each course breaking joint with the course below, except as may otherwise indicated or specified. Bond shall be kept plumb and uniform. Sufficient “line block” shall be provided to maintain level bed joints. Face coursing

shall be laid out before setting, and cutting closures or jumping of bond shall be minimized. Hollow units shall have mortar on shells only with end joints filled.

Each course shall be solidly bedded in mortar and joint shall be approximately 3/8 inch wide. Vertical joints shall be buttered their entire height. Each course shall be bonded at corners and intersections and shall be bonded into or anchored to the adjacent construction with metal anchors spaced not over 32 inches on centers in both directions. No cells shall be left open in face surfaces.

All cutting of exposed concrete blocks shall be done with a motor driven saw to insure straight evenly cut edges. No cracked or chipped units will be permitted in exposed masonry.

Masonry units shall be set with care around frames so as not to change the position of the frames. Units set around the tops of door frames shall have the joints broken to minimize the danger of loosening the units due to door jarring. Blocks shall be set tightly against metal frames and all voids slushed full. Frame anchors shall be built into the joints. Units shall be cut accurately to fit around all pipes, ducts, openings, etc., and all voids slushed full. All hollow metal frames shall have jambs and head filled solid with mortar. Masonry units which are adjacent to openings and which support additional loads, such as lintels, brackets, mechanical or electrical equipment shall have their cells completely filled with mortar. Masonry units receiving anchor bolts shall have their cells completely filled with mortar.

At locations where conduits, pipes, etc., are to be enclosed with exposed concrete blocks, the block units shall be installed in a manner to produce the regular concrete block-joining pattern of the adjacent surfaces. Concrete block shall be accurately cut to fit around concealed items and the necessary reinforcement etc. shall be provided for bonding where split block units are used. All cutting and fitting for passage of pipes, sleeves, ducts and other similar work shall be neatly done with caulking space of 1/4 inch wide by 3/4 inch deep provided around all wall openings. Holes made in exposed blocks for attachment of handrail brackets and similar items shall be neatly drilled. All necessary special jamb blocks, irregular and regular angle blocks where required to obtain smooth, evenly jointed and regular block patterns shall be provided throughout all exposed surfaces. All exposed joints in concrete block shall be tooled concave. Fabric flashing shall be installed in accordance with manufacturer's directions, just above the base slab contact and at other locations shown on the drawings. The end joints or side laps shall be 6 inches and all laps shall be bonded with Nervaplast Cement. The use of solvents or tape for sealing joints is not acceptable. The fabric flashing shall take the shape indicated in its normal relaxed state. Stretched or saggy installation shall not be acceptable. Where flashing is cut for passing through reinforcing, etc., cuts shall be made neatly and then patched by Nervaplast Cement, or approved equal, to form a watertight seal.

Frames, bucks, struts, hangers, lintels, access doors, miscellaneous metal and other items of work shall be installed as the masonry work progresses. All steel surfaces in contact with or adjacent to masonry shall receive a heavy asphalt coating. Chases, slots, reglets or other openings necessary for mechanical and electrical specialty work shall be formed as required.

Window and doorsills, doorjamb and frame sections shall be filled solidly with mortar. Hollow masonry units shall be filled solidly with mortar for one course under joust lintels and sills and for three courses under steel beams. Walls terminating against the bottom of beams shall be wedged tight and filled with mortar.

All work shall progress in as clean a manner as possible, with excess materials and mortar dropping removed daily. Mortar droppings on connecting or adjoining work shall be removed before attaining final set. Upon the completion of the work, all holes in the joints of exposed masonry surfaces shall be pointed by completely filling with mortar. After the mortar has hardened, all masonry surfaces exposed in the finished work shall be wetted then cleaned with a solution of 10 percent by volume of muriatic acid applied with stiff fiber brushes leaving the masonry clean, free of mortar dabs and with tight mortar joints throughout. The acid solution shall be controlled so as not to unduly come in contact with adjacent surfaces. Immediately after cleaning, the masonry surfaces shall be rinsed down with clear water. The use of wire brushes or other approved method, which shall produce a similar satisfactory surface, shall clean concrete block exposed in the finished work. Exterior corners on interior walls shall be bull nose masonry block including window and doorjamb where masonry is exposed.

Unfinished work shall be stepped back for joining with new work; tothing will not be permitted. Before new work is started, all loose mortar shall be removed and the exposed joint thoroughly wetted 12 hours before laying new work. Weep holes shall be provided at 36-inch centers for the first course above the flashing.

3. Joints. Exposed face joints shall be cut flush and as the mortar takes its initial set, tooled with a round, two-handed tool six inches longer than the masonry units. Tooling shall compact the mortar tightly against the masonry units on both sides of the joint. The head joint shall be tooled first.
4. Reinforcement. Masonry reinforcement shall be installed in every other course of all the walls, in the first and second bed joints above and below all openings, extending two feet beyond each side of the opening and within 12 inches horizontally of all openings. The reinforcements shall be centered in the wall so that it is approximately one inch from each face. Fabricated corner and tee sections shall be used to form continuous reinforcement around corners and to anchor abutting walls and partitions. Reinforcement

shall be continuous, with at least six-inch laps at splices, except that it shall not pass through vertical masonry control or expansion joints.

6.3 CARPENTRY WORK

A. GENERAL

Lumber shall be of the kind, size and dimensions required and suitable for the work. It shall be free from shakes, waness, black and unsound knots, decay and other defects. Lumber shall meet the general requirements of ASTM D-245. Lumber shall conform to the commercial association grades and sizes based upon American Lumber Standards as specified in the Federal Bureau of Standards Simplified Practice Recommendation R-16. Moisture content shall be in accordance with standard grading rules, except as otherwise specified. All wood shall be kiln-dried. All lumber shall be stored in a dry location off the ground and in such a manner to prevent unnecessary damage. Lumber shall be surfaced four sides and shall be squared to the required dimensions throughout its entire length.

B. MATERIALS

1. Miscellaneous Lumber. Framing and structural lumber, wood plates, nailers, furring, blocking and similar items shall be No. 2 Common Southern yellow pine or Douglas fir.
2. Sheathing. Sheathing shall be DFPA plugged exterior grade. Plywood shall be DFPA grade marked and shall be laminated with L-1R mold and moisture-resistant adhesive.
3. Hardware. Bolts, nuts, clamps, expansion screws, washers and anchors shall be galvanized steel. Wood screws shall conform to Fed. Spec. FF-S-111. Exposed screws shall be chrome-plated brass Phillips Head. Nails shall be helical or annular thread types. Nails for exterior use shall be galvanized steel except in aluminum or copper material, where nails of like material shall be used.

6.4 MISCELLANEOUS METALS

- A. Miscellaneous metals shall be welded with sharp lines and angles. Welds at connections shall be ground smooth. Exposed surfaces shall have smooth finishes. Shapes and sizes shall be designated on the plans where necessary to avoid misinterpretation of the type metal required.
- B. Loose lintels shall be furnished as indicated or required. Lintels shall be centered over openings with a minimum of eight-inch bearing at each jamb.
- C. Aluminum shall conform to the requirements of the Aluminum Association for Alloy 6061-T6. All aluminum items shall receive an anodized finish.

Aluminum in direct contact with dissimilar metals shall be insulated with bituminous-impregnated felt strips. Aluminum placed in direct contact with concrete shall be coated with asphalt paint.

- D. All anchor bolts, assembly bolts, screws, and nuts shall be as detailed on the plans. Unless noted otherwise, all fasteners should be of ample section to safely withstand field-loading conditions. Hardware for use in the wet well and valve vault and for use with aluminum items shall be stainless steel.

6.5 ELECTRICAL WORK

A. GENERAL REQUIREMENTS

The Owner/Developer shall perform all electrical work necessary for the installation of the pump station equipment and service complete, tested, and ready for use. All work shall be completed by mechanics skilled in this type work and left in first class operation condition.

B. CODES AND STANDARDS

The latest effective publications of the following standards, codes, etc., as they apply, form a part of these specifications as if they were written fully herein and constitute minimum requirements. Minimum requirements shall not relieve the Owner/Developer of the responsibility of furnishing and installing higher-grade materials and workmanship if specified in the following:

1. National Electrical Code. (NFPS 70) (NEC).
2. Standard Rules of Institute of Electrical and Electronic Engineers (IEEE).
3. Service Rules and Regulations of Virginia Power Company.
4. Applicable Standard of the National Electrical Manufacturer's Association (NEMA).
5. Applicable Standards of the American National Standards Institute (ANSI).
6. Applicable Standards and Lists of the Underwriter's Laboratories, Inc. (UL).
7. Applicable Standards of the National Fire Protection Association (NFPA).

C. PLANS AND SPECIFICATIONS

The plans shall be diagrammatic and indicate the general extent, character and arrangement of equipment, fixtures and conduit and wiring systems. If any

departures from the approved plans are deemed necessary, the Owner/Developer shall submit details of such departures and the reason therefore as soon as practicable to the City Engineer for approval. No such departures shall be made without prior written approval of the City Engineer.

In case of conflicting information on the plans and/or in the specifications, an Authorized City Representative shall make the interpretation.

D. MANUFACTURING STANDARDS

Materials shall be new and approved and labeled by UL. Defective equipment or equipment damaged in the course of installation or test shall be replaced or repaired in a manner meeting the approval of the City. Materials to be furnished under this specification shall be the standard products of manufacturer's latest standard approved design. All items of the same type and rating shall be identical.

E. TRADE NAMES

Unless specifically identified otherwise, manufacturer's names and catalog numbers indicated herein and on the plans are not intended to be proprietary designations. They are to indicate general type and quality of materials and equipment required. Equipment and materials by other manufacturers which in the opinion of the City Engineer are of equal quality and which will produce the same results with regard to both their ability to perform the required technical functions as well as to their appearance in the specific location on this project will be considered.

F. LABELING OF EQUIPMENT

All panel boards, cabinets, safety switches, motor disconnect switches, and motor controllers shall be identified by machine engraved laminated plastic designation plates permanently attached thereto. All component parts of each item of equipment or device shall bear the manufacturer's nameplate, giving name of manufacturer, description, size, type, serial and model number and electrical characteristic in order to facilitate maintenance or replacement.

G. GROUNDING

The entire electrical system including equipment frames, conduit, switches, controllers, wire ways, neutral conductors, and all other such equipment shall be permanently and effectively grounded as indicated or specified and in accordance with NEC. Grounding shall be accomplished in a neat and inconspicuous manner. The ground connections shall be made at the main service equipment. Resistance to ground shall not exceed 25 Ohms.

H. ELECTRICAL SERVICE

The electrical service shall be 3 phase, of the characteristics most suitable for the total service necessary for the station operation. The Owner/Developer shall make all necessary contact with Franklin Power and Light engineering personnel. All arrangements shall be made with proper extension, terminations, provisions and necessary materials for final connections to all equipment. Service and all metering shall be provided in accordance with the latest regulations of the Franklin Power and Light.

I. RACEWAYS AND FITTINGS

Conduit shall be hot-dipped, zinc coated rigid steel (RS).

Flexible conduit shall be provided for connections to vibrating or moving equipment and shall be galvanized, continuous spiral, single strip type.

In areas subject to moisture or where indicated, flexible conduit shall have plastic covering. Fittings shall be standard UL approved with ground connector. Watertight connectors shall be used with plastic covered flexible conduit. An equipment ground conductor shall be provided in each run of flexible metallic conduit sized in accordance with NEC (minimum size #12 AWG) bonded to outlet box, cabinet or equipment at each end. Minimum size conduit shall be ½ inch with larger sizes as required by NEC number of wires contained therein.

Underground conduits shall be coated with 2 coats of Bitumastic paint or may be concrete encased PVC Schedule 40. No PVC shall be exposed in any fashion at the completion of the project.

Fittings shall be threaded type. All conduit entering or leaving outlet, junction or pull boxed, and cabinets shall have bushings. Conduit stubs shall have insulating bushings. Expansion fittings with bonding jumpers shall be provided where conduits cross expansion joints or other suitable means shall be provided to compensate for building expansion and contraction.

RACEWAY AND FITTING INSTALLATION

Conduits may be exposed within the structure, surface-mounted or concealed. There shall be no exposed conduits outside of the structure. Conduits shall be supported at intervals of not more than 8 feet and shall be run parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceiling. Changes in direction of runs shall be made with symmetrical bends or cast metal fittings. Field made bends and offsets shall be avoided where possible, but where necessary they shall be made with an approved hicky or conduit bending machine. No bend shall have less than 3 ½ inch radius. No bend shall be more than 90 degrees. There shall not be more than four right angle bends or the equivalent in one run. Conduit shall have clean, sharp threads carefully reamed ends and tight joints. Crushed or deformed conduits shall not

be installed. Trapped conduits shall be avoided. Care shall be taken to prevent the lodging of plaster, dirt or trash in conduit, boxes, fittings and equipment during the course of construction. Clogged conduits shall be entirely cleared of obstructions or shall be replaced. Blasting caps or other explosive devices shall not be used to clear obstructions. Conduit shall be fastened to all sheet metal boxes and cabinets with two locknuts where required by NEC, where insulation bushings are used, and where bushings cannot be brought into firm contact with the box, otherwise a single locknut and bushing are acceptable. Conduits shall be supported by pipe straps, wall brackets, strap hangers, or ceiling trapeze, fastened by wood screws on wood, toggle bolts on hollow masonry units, bolts and expansion shields on concrete or brick, and machine screws or welded threaded studs on steel work. Unless otherwise indicated, nail type nylon anchors provided with lock washers and nuts or threaded steel studs driven in by powder charge and provided with lock washers and nuts are acceptable in lieu of expansion shields or machine or wood screws. Wires twisted around structural members as a support for conduits will not be acceptable as a base for conduit fastenings, nor shall conduit or pipe straps be welded to steel structures.

Junction or pull boxes not over 100 cubic inches in volume shall be standard outlet boxes. Junction boxes over 100 cubic inches in volume shall be constructed of code gage galvanized sheet steel. Junction boxes shall have removable covers and shall be accessible after completion of the structure. Wall brackets, trapeze, strap hangers, pipe straps and structural supporting units such as KINDORF, KEYSTONE, or UNI-STRUT complete with hangers, connectors, bolts, clamps and accessories as required shall be provided to support raceways, fittings, boxes, fixtures and equipment.

J. OUTLET BOXES, JUNCTION BOXES, CABINETS

Fixture outlets, receptacles, switches, and devices, requiring outlet boxes shall have metallic outlet boxes. Except as noted hereinafter minimum size of outlet boxes shall be 4 inches square, 1 ½ inches deep (minimum, and shall be increased in dimensions to accommodate conductors and devices as required. Outlet boxes shall be cast alloy or aluminum with threaded hubs.

K. OUTLET BOX, JUNCTION BOX AND CABINET INSTALLATION

Outlet and junction boxes shall be installed where necessary in a rigid and satisfactory manner and supported by bar hangers in frame construction or fastened directly with wood screws on wood, bolts and expansion shields on concrete or brick, toggle bolts on hollow masonry units, and machine screws or welded threaded studs on steel work. Unless otherwise indicated nail-type nylon anchors provided with lock washers and nuts or threaded steel studs driven in by powder charge and provided with lock washers and nuts are acceptable in lieu of wood screws, expansion shield, or machine screws.

L. CONDUCTORS

A complete system of conductors shall be provided as indicated or necessary to accomplish the required connections. All conductors shall be installed in a neat and workmanlike manner, with care being taken that conductors are not kinked, scarred, or damaged during installation. Wire and cable shall be soft drawn, annealed copper with 600-volt insulation. The minimum wire size shall be # 12 AWG. Conductor sizes 12-10, insulation shall be type THW, or RHW for installation in ordinary dry locations and type THWN for installation in wet locations except the branch circuit lighting and receptacle conductors may be type TW. Wet locations will include service conduits, conduit underground, raceways installed in concrete floor slabs in direct contact with the earth and raceways regularly subject to moisture or condensation. Conductor sizes larger than #6 shall be Type XHHW insulated.

All branch circuit, feeder and control wiring shall be color-coded in accordance with NEC. Color shall be integral with sheath for sizes 12 through 8. One-half inch wide color-coded plastic tape stripes shall be provided for conductor's sizes 6 and larger. Strips shall be placed on conductors a minimum of 6 inches on center in all panel boards, junction boxes, pull boxes, conduit fittings, disconnect switches and anywhere the conductors are accessible and visible. Phase sequencing shall be maintained in all panels, disconnects, etc. Sequence shall be as prescribed by Franklin Power and Light.

M. JOINTS AND TERMINATIONS

At least 6 inches of free conductor shall be left in each outlet or junction box for making up joints and making connections to fixtures, devices or equipment. For conductors #12 and #10, all fixtures and branch circuit joints in junction and outlet boxes shall be made with UL, listed pressure type connectors rated at 600 volts and 105 degrees C. The connector body shall consist of a cone-shaped, expandable, square-edged, coil-spring insert, insulated with a color-coded, self-extinguishing nylon shall with two wings placed opposite to each other to serve as a "built-in" wrench. The shell shall be molded of one piece. Connectors shall be IDEAL, INDUSTRIES "Wing-Nut" or BUCHANNAN "B-CAP", 3M "SCOTCH-LOK" connectors or equal. Wire #8 and larger shall be joined or solder-less pressure connectors properly taped in layers to form a moisture-tight joint.

N. CONDUCTOR INSTALLATION

Conductors shall be continuous from outlet to outlet, and no splices shall be made except within outlet or junction boxes. Conductors shall be pulled by hand and without aid of block and tackle or other mechanical device. Only approved pulling compounds which will in no way damage the insulation on the conductors or hasten its aging may be used to facilitate pulling of wire into conduit. Branch circuits shall be No. 12 AWG copper minimum except as



shown. Circuiting shown shall be followed unless the Engineer approves specific changes. Where several feeders pass through a common pull box or junction box, the feeders shall be tagged to indicate clearly their electrical characteristics, circuit number, and panel designation. The same information shall be painted on cover of the box.

O. WIRING DEVICES

Wiring devices shall be as manufactured by GENERAL ELECTRIC, SLATER (MEDALIST), ARROW-HART, BRYANT, HUBBELL, or PASS & SEYMOUR. All wiring devices provided shall be by the same manufacturer and shall be “specification grade.”

Switches shall be single pole, double pole, three way or four way as shown on the plans, plastic handle, back or side wired, 20 ampere, 120-277 volts.

Duplex receptacles shall be brown plastic. 20 ampere, 125, 3 pole, 3 wire NEMA and ANSI Standard, grounding type.

Ground fault circuit interrupting receptacles shall conform to NEC, shall be UL listed, shall have a “push-to-test” button and visible indication of a tripped condition, and shall detect a current imbalance in device or equipment plugged-in of approximately 5 milliamperes and trip out under those conditions.

Device plates in normally dry locations shall be zinc-coated sheet steel having rounded or beveled edges. Weatherproof device covers shall be cast metal alloy, gasketed and hinged at the top.

P. LIGHTING FIXTURES

Lighting fixtures shall be UL, approved, listed and labeled for the particular installation. Lighting fixtures shall be provided complete with lamps, mounting hardware, accessories, canopies, necessary guards, straps, supports or hangers and other miscellaneous materials and devices to assure satisfactory installation and desired function where installed and shall be approved before installation.

Q. TRANSFER SWITCH

A three-pole double throw manual transfer switch shall be provided and wired between the incoming service and the control panel. The transfer switch shall be 600-volt heavy duty and sized for the incoming service amperage. The enclosures shall be NEMA 12 for indoor usage and NEMA 3R for mounting outside. The operating handle must be pad-lockable in all three positions. A standard padlock must be able to pass through a plate on the enclosure so as not to be able to force the lever into another position. The main power shall be wired so as to be energized when the operating lever is in the upper position. When the lever is in the lower position, the station shall run on the generator power, which is provided through a receptacle outside of the building.



R. GENERATOR RECEPTACLE

A three pole four wire generator receptacle shall be mounted outside the building and wired to the transfer switch. The receptacle shall be manufactured by Killark Manufacturing Company with the following part numbers:

<u>SERVICE SIZE</u>	<u>RECEPTACLE PART NUMBER</u>
200 A	VR2412-S39

S. ELECTRICAL CONTROL PANEL (SUCTION LIFT STATIONS)

The control system supplier shall be responsible for complete control system design, shop drawings to include installation drawings and wiring diagrams, submittal data and start-up assistance.

Drawings adequate for panel fabrication, installation and maintenance shall be submitted and approved prior to the control panel manufacturer starting any fabrication.

The control system shall be furnished to control two pumps driven by motors at horsepower and voltage ratings as noted, 3 phase, 60 hertz with across the line non-reversible magnetic starters for pumps with motors less than 40 hp.

All components shall be those specified or equal manufactured by an established manufacturer with replacements available from local suppliers.

The Owner/Developer shall furnish and install a pressure transducer liquid level pump control system housed in a NEMA 12 control panel. All field devices shall be terminated to tubular terminal blocks or pneumatic type bulkhead fittings. All front mounted devices shall be heavy-duty oil tight, dust tight NEMA 12 rated devices. The finished control panel must maintain the NEMA 12 rating.

Enclosure shall be constructed from 14-gauge steel; NEMA 12 design with Flange mounted circuit breaker operator for main and pump breakers. Enclosure shall be provided with 3-point door latching hardware. Panel shall be painted white on the inside and eggshell on the outside. Panel shall be sized according to NEC, NEMA and JIC requirements and allow enough room in the enclosure for neat field installation and easy maintenance. Panel shall be Hoffman Bulletin A-25, Hammon Series 1447 or approved equal. Two corrosion inhibitors shall be installed in the control panel, sized according to manufacturer recommendation. Corrosion inhibitor shall be Hoffman A-HCI10E or approved equal.

INTERIOR MOUNTED DEVICES

1. Main circuit breaker sized as shown. Flanged circuit breaker operation to be provided and also interlocked with enclosure door to prevent door from opening unless main breaker is de-engaged. Through the door circuit breaker operators will not be accepted. Circuit breaker will be sized to handle the full load current of the pump station and under fault clear the interrupting current available from Franklin Power and Light
2. Pump circuit breaker shall be Motor Circuit protector type with adjustable instantaneous magnetic trip, which is NEMA, rated for the horsepower load of the pumps. Circuit breakers for pumps are to be equal to Cutler Hammer, HMCP, or Westinghouse MCP. Pump circuit breaker are to have flanged mounted operators. Through the door operators are not acceptable.
3. Full voltage across the line starters, NEMA and horsepower rated for each pump motor less than 40 hp shall be provided.
4. Properly sized overload thermal elements shall be provided for each phase. Starters shall be Allen Bradley 509 Series or approved equal. On 480V 3 phase stations, the installer will provide a 2-pole 480V circuit breaker to feed remote mounted 7.5 KVA 480V to 240/120V transformer. Transformer shall be provided with panel board to be mounted by the installer.
5. Three-phase power monitor shall detect loss of phase, phase reversal or low voltage conditions. Power monitor shall be wired so as to de-energize the control circuit to the pumps and close a set of contacts wired to a terminal strip or the alarm transmitter. Fuse blocks and fused shall be provided for each phase for the power monitor. Power monitor shall be Diversified SLA or approved equal.
6. Alternator shall provide automatic alternation of pumps. Alternator shall change lead pump on each successive cycle. Alternator shall be Diversified ARA or approved equal.
7. Pump failure timer shall be adjustable plug in type with a range of 0-300 seconds. Time delay shall be Diversified TUC-120-ALA-300 or approved equal.
8. Pump failure relays shall be three heavy-duty plug-in type. Relays shall be IDEC RH series or approved equal.
9. Over temperature relays will be provided on suction lift type pump stations or where otherwise indicated. Relays shall be heavy-duty plug-in type. Relays shall be IDEC RH series or approved equal.

10. Latch relays shall be provided to control the starting and stopping of the pumps by the level controller. Latch relays shall be of the plug-in type and shall be IDEC RR2KP-U or approved equal.
11. Tubular, barrel type terminal strips shall be provided for terminating all field wiring. Open screw type terminals will not be acceptable.

EXTERIOR MOUNTED ITEMS

1. Flanged circuit breaker operators shall operate Main and pump circuit breakers. Main and pump circuit breaker operator shall be interlocked with enclosure door to prevent opening of door while main breaker is energized. Breaker operators shall be Cutler Hammer C371 series or approved equal. Through the door operators will not be acceptable.
2. White control panel light shall be heavy-duty oil tight and be of either transformer or resistor type. Pilot light shall be Allen Bradley 800T-Q11W.
3. Green pump running light shall be provided for each pump. Light shall be Heavy-duty oil tight and be of either transformer or resistor type. Pilot light shall be Allen Bradley 800T-Q11G or approved equal.
4. Pump failure light shall be provided for each pump. Pilot lights shall be heavy-duty oil tight and be of either transformer or resistor type. Pilot light shall be Allen Bradley 800T-QB11R or approved equal.
5. Illuminated over temperature reset light shall be provided for each pump on suction lift station. Resets shall be heavy-duty oil tight. Reset shall be Allen Bradley 800T-QB11Y, amber color or approved equal.
6. Hand-Off-Auto switch shall be provided for each pump. Switches shall be of the heavy-duty oil tight type. Switches shall be Allen Bradley 800-T-J2A or approved equal. Hand side of switch shall be spring loaded to prevent pumps from being left in the hand position.
7. A three position switch shall be provided to select pump alternation, No. 1 lead or No. 2 lead. Switch shall be heavy-duty oil tight type. Switch shall be Allen Bradley 800-T-K2KP7C or approved equal.
8. Reset push buttons for each pump starter shall be provided. Units to be Cutler Hammer 10935-H6 or approved equal.

T. FIELD MOUNTED DEVICES FURNISHED WITH PANEL

Check valve limit switch shall be provided for each pump. Unit shall be heavy duty NEMA 4, Allen Bradley 802T-H or approved equal. Limit switch arms shall be provided to suit the check valve installed.

Heat sensors for each pump shall be provided for suction lift pumps. Heat sensors shall be mounted in FS type box, or directly to the volute of the pump.

A float switch will be provided for the wet well low and high-level alarm and RTU high-level alarm. Float switches shall be provided with 40 feet of cord. Float switches shall be Waterguard or approved equal with switch type being normally opened.

On 480V 3 Phase stations a 480-240 volt 7.5 KVA Transformer shall be provided for 240-120 volt panel board.

On wetwell/drywell stations, a lockout will be provided for each pump in the drywell within sight of its respective pump. Lockout will be wired in series with the power circuit for its respective pump station. Unit shall be Cutler Hammer 10250H665 or approved equal.

6.6 SEQUENCE OF OPERATION

A pressure type control system will control the liquid level. The controller shall have eight set points. A- Pump One, B- Pump Two, C- Low Level Alarm, D- High Level Alarm to RTU, E-H as spares. The start and stop points will be set with the buttons on the front face of the Controller. As the water level rises above the first start level, the lead pump will start. On a further rise in level, the lag pump will start. On three pump systems as the liquid level continues to rise, a third pump will be started. When the liquid level falls to the single stop point, all the pumps shall shut down.

A lead/lag switch will select the sequencing of the pumps. In the alternate position each successive starting and stopping of the lead pump will cause the system to rotate the pumps on the next pump start.

A Hand-Off-Auto (H-O-A) switch shall be supplied for each pump to allow hand operation for each pump. In the automatic position, each pump will be under control of the level transducer.

Pump failure to operate shall be detected by limit switches mounted in the pump check valves. When a pump is called to run, a time delay shall be energized to allow enough time for the pump to achieve prime. If after this set time elapses, and the check valve limit switch has not detected flow, the respective pump failure light will be illuminated and a relay contact will close signaling to the alarm transmitter the respective pump failure. Pump "Failure to Operate" shall lockout the pump and shall remain inoperable until manually reset.

Pump failure as stated above shall be provided for each pump.

On suction lift stations, pump over-temperature is to be detected by thermostat provided for each pump. Upon sensing over-temperature condition the affected pump will shut down, a red pilot indicating light on the control panel will illuminate



and an alarm signal initiated to the telemetry equipment and the other pump shall be signaled “ON.” The effected pump will be locked out of operation until the fault is cleared and the illuminated pilot light/reset. Hand operation of the H-O-A switch shall override the lockout condition.

The three-phase power monitor shall detect a phase loss, phase reversal, and low voltage condition, and shutdown the control circuit to the pumps and initiate a signal to the alarm transmitter.

The following alarm condition shall close a relay contact upon alarm and be wired to a terminal strip for remote connection to an alarm transmitter:

1. High Water Wet Well
2. Power Failure
3. Pump No. 1 Failure
4. Pump No. 2 Failure
5. Intrusion
6. Test Function
7. Low Wetwell Level
8. Emergency Power Failure
9. Pump Station Entry Door Alarm
10. Generator Run
11. Transfer Switch Engaged

6.7 ALARM REPORTER

A radio alarm transmitter shall be provided and programmed to signal failure of critical functions in the pump station. Alarm conditions shall be transmitted by Strison Wireless Cell Alert 2000. The alarm transmitter shall be capable of transmitting the following alarm conditions:

1. High Wetwell level
2. Power Failure
3. Pump No. 1 Failure
4. Pump No. 2 Failure
5. Intrusion
6. Test Function
7. Low Wetwell Level
8. Emergency Power Failure (If Applicable)
9. Pump Station Entry Door Alarm
10. Generator Run
11. Transfer Switch Engaged In Addition To The Alarm Conditions.

A CITY OF FRANKLIN REPRESENTATIVE WILL VERIFY EACH MEASUREMENT TEST POINT; AND ALL MEASUREMENTS WILL BE RECORDED AND SUBMITTED TO THE CITY OF FRANKLIN.

6.8 WET WELL/DRY WELL STATIONS

- A. Pumps shall be located so as to have a positive suction head at the start of the pumping cycle. Pump motors and controls shall be located above grade. Pumps shall be capable of passing 3-inch solids, shall be sufficient in number to pump peak flow in the event that one pump is inoperable. Peak flow shall be defined as 2-1/2 times the average rate of influent flow against the maximum TDH. Motors shall have sufficient horsepower to meet maximum power requirements and shall be non-overloading throughout the entire curve. Motors shall be designed to meet both maximum and minimum head conditions where connected to a closed force main or interceptor system. Pump motors shall be three phase, 60 cycle with speeds of 860 through 1750 RPM. Pumps using “bladeless” impellers may be used where discharge heads are to be always constant, but otherwise shall not be specified. Pumps shall be designed to permit installation of larger impellers where practical in the event of future increased flow or high head conditions, and smaller impellers in the event of lower head conditions.
- B. Discharge piping shall be designed for a minimum, of 2 FPS velocity and a maximum of 8 FPS and suction piping for 2 FPS minimum with suction inlet velocity of 6 FPS maximum. Piping shall be ductile iron pipe with flanged joints manufactured in accordance with AWWA/ANSI C115/A21.15, latest edition.
- C. Gate valves shall be provided on the suction side of the pumps and gate and check valves on the discharge side to be mounted horizontal. The influent sewer shall be provided with a gate valve outside the station and with a bar screen with drained accessible concrete floor with adequate trash storage capacity. Gate valves shall be cast iron body, bronze mounted, solid wedge type with non-rising stems, conforming to AWWA Specification C500, latest edition as manufactured by American AVK Valve and Fittings Company, or an approved equal. Gate valves shall have flanged ends and open left when located above ground. All valves located below grade shall have a 2” operating nut
- D. Check valves shall be the swing-check type, iron body and bronze disc with rubber face, full port opening valves with outside weight and lever. Valves shall have flanged ends, shall be suitable for operation at 175 psi and shall be manufactured by American AVK, or an approved equal.
- E. No butterfly valves shall be permitted.
- F. A detention time of 20 minutes based on average flow shall be provided in the wet well. Both the wet well and pump pit shall be provided with adequate mechanical ventilation and a heater shall be provided in the motor room. A minimum of 1 foot freeboard shall be provided between the influent invert and high water level.

Potable water shall be furnished in the control room by means of a hose bib with vacuum breaker. Emergency pump connections shall be provided on the force main and pump station so located as to permit a portable pump to take suction from the



wet well by an emergency suction connection and discharge into the emergency pump connection with a gate valve between this connection and the station.

6.9 EMERGENCY PUMP

The Owner/Developer may be required to supply an emergency pump to provide for emergency pumping during station outages.

6.10 STARTUP AND DEMONSTRATION

Refer to requirements of the City of Franklin Construction Standards and Specifications for Water Facilities Part II, Section 6-3.

6.11 OPERATION AND MAINTENANCE MANUALS

Refer to requirements of the City of Franklin Construction Standards and Specification for Water Facilities Part II, Section 6-4.

VALUE ENGINEERING

SECTION 1 – VALUE ENGINEERING PROPOSAL

1.1 GENERAL

The Owner/Developer may submit to the City Engineer a written Value Engineering Proposal (VEP) for modifying the City of Franklin standard plans, specifications, or other requirements of the project for the purpose of reducing the total cost of construction without reducing the design capacity or quality of the finished product.

Each VEP shall result in a savings without impairing essential functions and characteristics of the item(s) or of any other part of the project, including, but not limited to service life, reliability economy of operation, ease of maintenance, aesthetics, and safety. As a minimum, the following information shall be submitted with each VEP:

4. Statement that the proposal is submitted as a VEP.
5. Statement concerning the basis for the VEP and benefits to the City and an itemization of the project items and requirements effected by the VEP.
6. Detailed estimate of the cost under the existing project and under the VEP.
7. Proposed specification and recommendations as to the manner in which the VEP changes are to be accomplished.
8. Statements as to the time by which adopting the VEP must be issued so as to obtain the maximum cost effectiveness.

The City may accept a VEP in whole or part by issuing a memorandum of agreement that will identify the VEP on which it is based. The City will not be liable to the Owner/Developer for failure to accept or act on any VEP submitted pursuant to these requirements or for delays in the work attributable to any VEP. Until a VEP is put into effect by a memorandum of agreement, the Owner/Developer shall remain obligated to the terms and conditions of the existing project. If an executed memorandum of agreement has not been issued by the date on which the Owner/Developer proposal specifies that a decision should be made or such other date as the Owner/Developer's proposal specifies that a decision should be made or such other date as the Owner/Developer may subsequently have specified in writing, the VEP shall be deemed rejected.

The memorandum of agreement effecting the necessary modification of the project will establish the net savings agreed on, and provide for payment terms. The Owner/Developer shall absorb all costs incurred in preparing a VEP.



Reasonably incurred costs for reviewing and administering a VEP will be borne by the City. The City may include in the agreement any conditions it deems appropriate for consideration, approval, and implementation of the VEP. The Owner/Developer's share of the net savings shall constitute full compensation to him for effecting all changes pursuant to the agreement.

Unless specifically provided for in the Memorandum of Agreement authorizing the VEP, acceptance of the VEP and performance of the work there under will not change the project time limit.

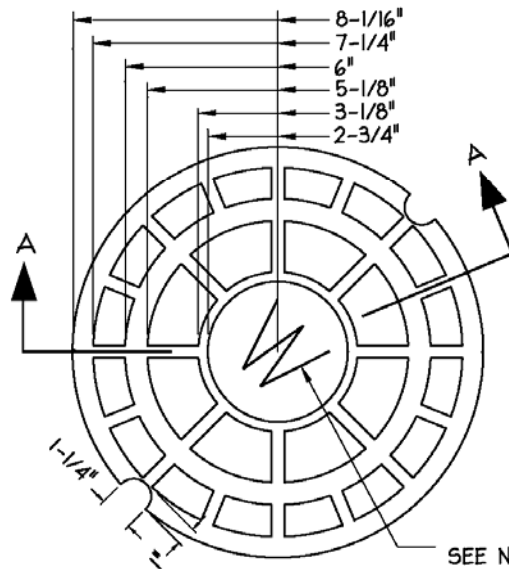
The City may adopt a VEP for general use in projects administered by the City if it determines that the VEP is suitable for application to other projects. VEP's identical with or similar to previously submitted VEP's will be eligible for consideration and compensation under these provisions if they have not been previously adopted for general application to other projects administered by the City. When a VEP is adopted for general use, compensation pursuant to these requirements will be applied only to those projects for which the VEO was submitted prior to the date of adoption of the VEP.

The requirements herein apply to each VEP initiated, developed, and identified as such by the Owner/Developer at the time of its submission to the Director of Public Works. However, nothing herein shall be construed as requiring the City Engineer to consider or approve a VEP.

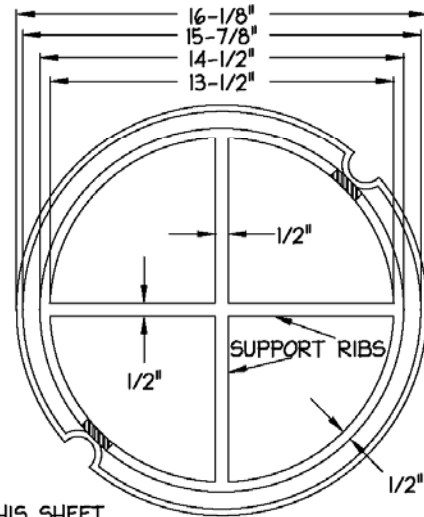
Subject to the provisions herein, the City or any other public agency shall have the right to use all or part of an accepted VEP without obligation or compensation of any kind to the Owner/Developer.

NOTE:

MARK WITH A "W" FOR WATER DISTRIBUTION SYSTEMS OR "S" FOR SANITARY SYSTEMS. TOP & BOTTOM OF LETTER DESIGNATION TO BE IN LINE WITH NOTCHES.



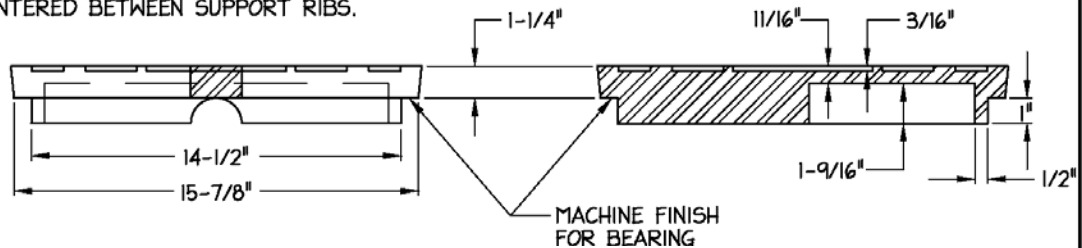
COVER: TOP



COVER: BOTTOM

SEE NOTE, THIS SHEET

BOTTOM SUPPORT RING TO BE NOTCHED DIRECTLY UNDER PICK HOLE ON BOTH SIDES. NOTCHES TO BE CENTERED BETWEEN SUPPORT RIBS.



SIDE VIEW

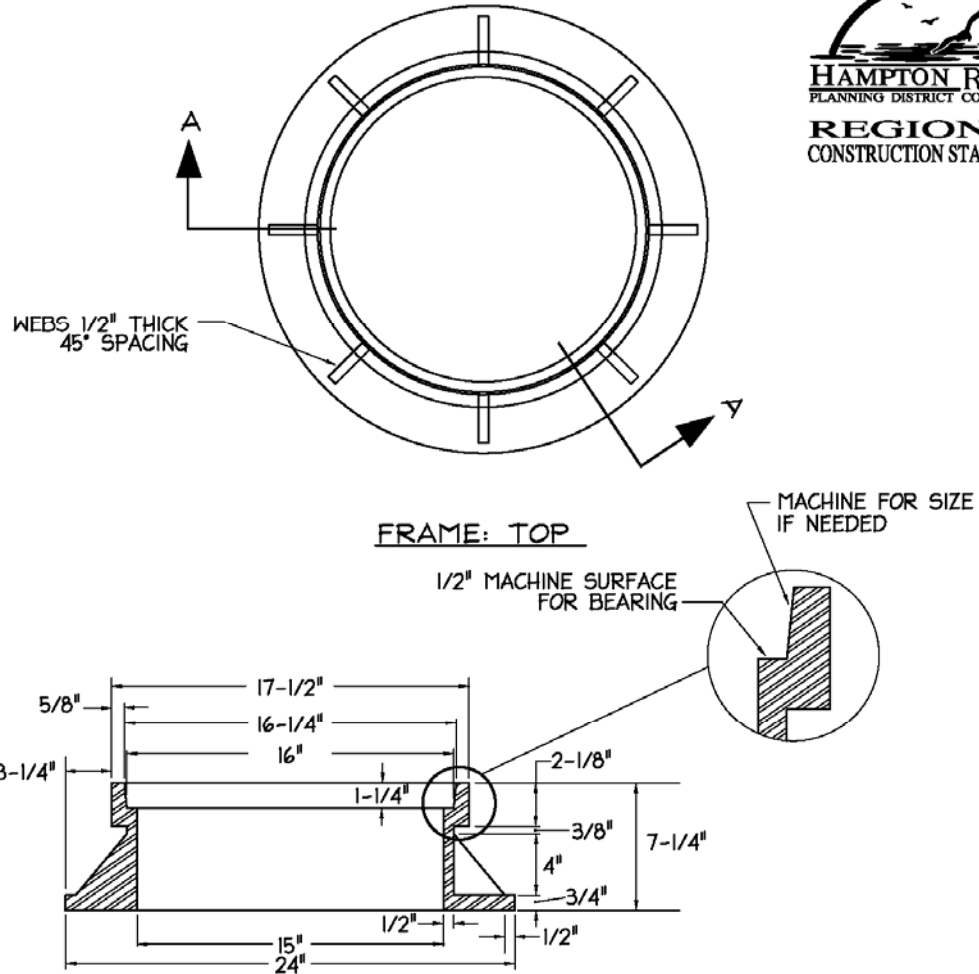
SECTION A-A

SEE WS_01, SHEET 2 OF 2 FOR NOTES & FRAME DETAILS.

**STANDARD VALVE BOX
FRAME AND COVER**

NOT TO SCALE

REFERENCE 200,801,803	CATEGORY WATER & SANITARY	DATE 01/03	SHEET No. 1 OF 2	DETAIL No. WS_01
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NOTES:

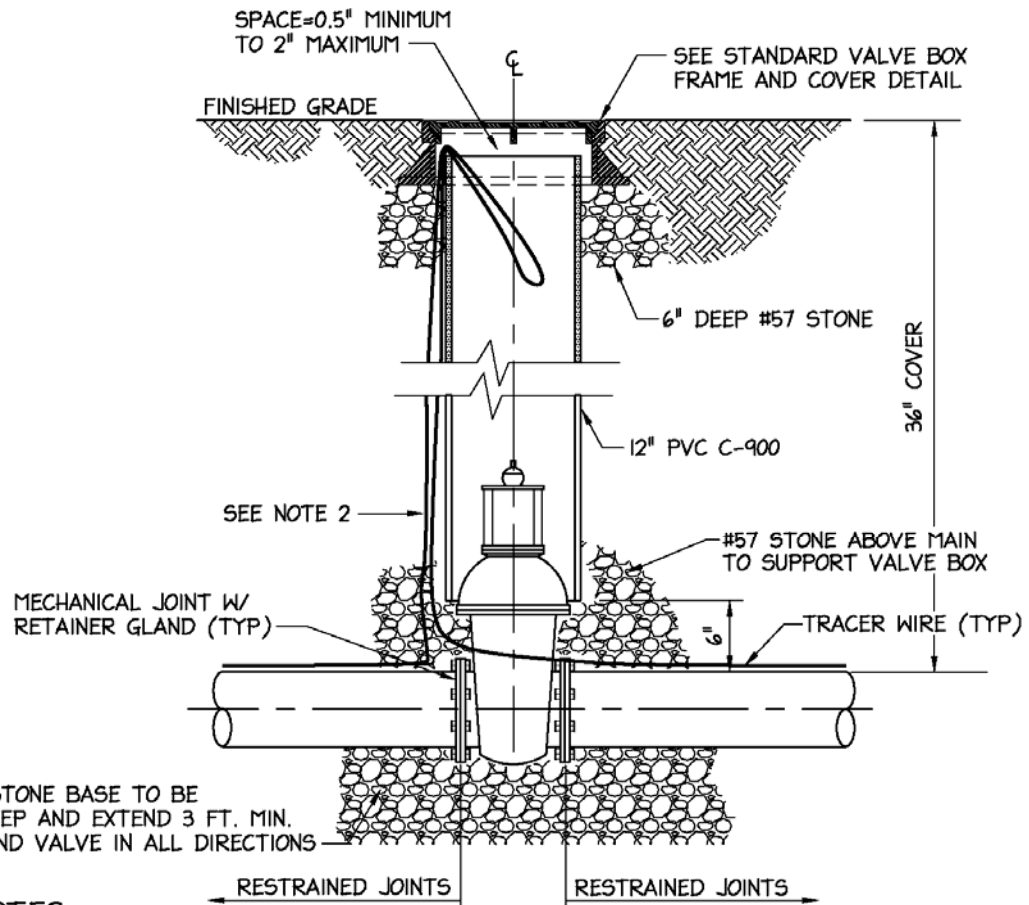
SECTION A-A

1. VALVE BOX FRAME AND COVER TO BE SUPPLIED BY CAPITAL FOUNDRY OF VIRGINIA, INC., MODEL #NPN-15*N, 160 LBS., OR APPROVED EQUAL.
2. ALL GRAY IRON CASTINGS SHALL CONFORM TO LATEST EDITION OF ASTM A-48, CLASS 30 AND SHALL BE OF UNIFORM QUALITY.
3. ALL CASTING DIMENSIONS SHALL HAVE A TOLERANCE OF 1/8"±.
4. ALL CASTINGS SHALL BE CLEANED BY SHOT BLASTING AND HAND CHIPPING UTILIZING STANDARD INDUSTRY PRACTICES PRIOR TO SHOP APPLICATION OF ASPHALTIC COATING, BY DIPPING.

**STANDARD VALVE BOX
FRAME AND COVER**

NOT TO SCALE

REFERENCE	CATEGORY	DATE	SHEET No.	DETAIL No.
200,801,803	WATER & SANITARY	01/03	2 OF 2	WS_01



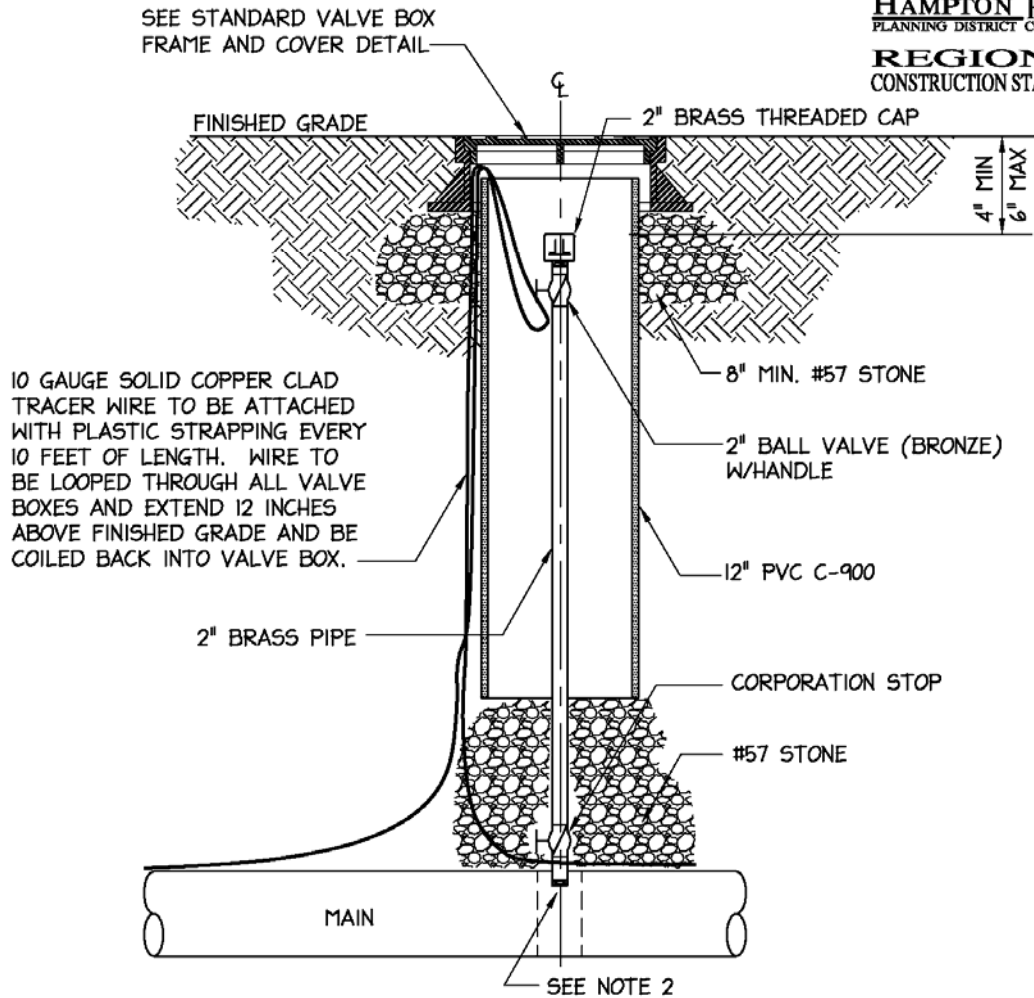
NOTES:

1. IF OPERATING NUT IS GREATER THAN 48" BELOW TOP OF VALVE BOX FRAME, A VALVE STEM EXTENSION MAY BE INSTALLED. THE EXTENSION SHALL REPLACE OR BE SECURELY ATTACHED TO THE NORMAL 2 INCH SQUARE OPERATING NUT, SHALL BE AT LEAST AS STRONG AS THE VALVE STEM, AND SHALL BE COATED IN ACCORDANCE WITH AWWA C550. VALVE STEM EXTENSIONS MUST BE APPROVED BY THE LOCALITY.
2. PLASTIC COATED 10 GAUGE SOLID COPPER TRACER WIRE TO BE ATTACHED WITH PLASTIC STRAPPING EVERY 10 FEET OF LENGTH. WIRE TO BE LOOPED THROUGH VALVE BOX AND EXTEND 12 INCHES ABOVE FINISHED GRADE AND COILED BACK INTO VALVE BOX.

VALVE SETTING DETAIL

NOT TO SCALE

REFERENCE	CATEGORY	DATE	SHEET No.	DETAIL No.
200,801,803	WATER & SANITARY	01/03	1 OF 1	WS_02



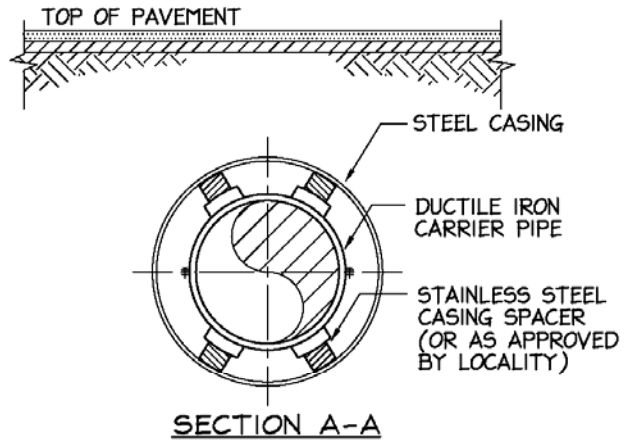
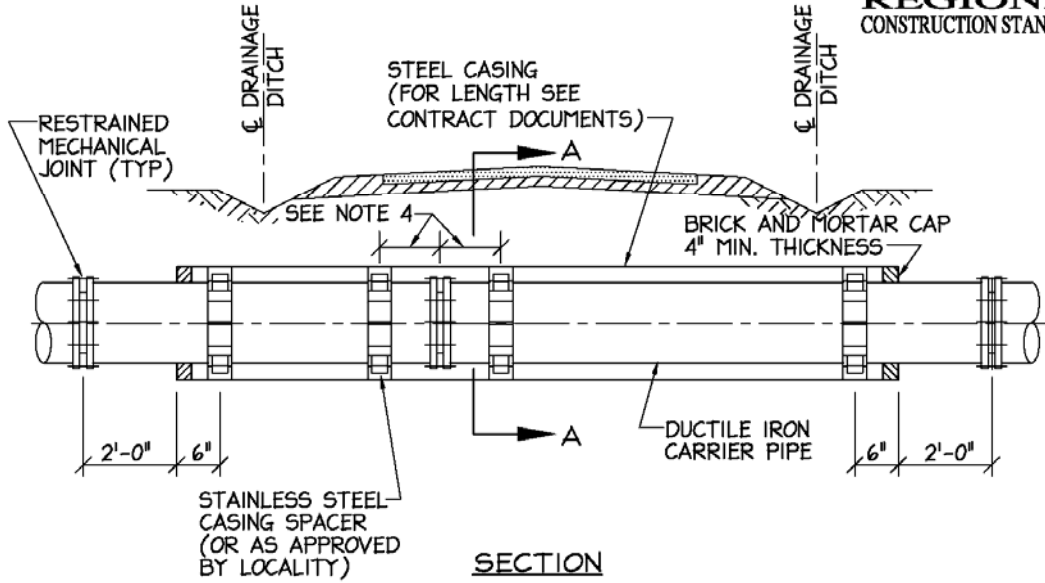
NOTES:

1. 2" BRASS PIPE AND FITTINGS SHALL BE USED FOR AIR RELEASE VALVE.
2. ALL DUCTILE IRON MAINS, SIX INCHES IN DIAMETER AND LARGER, MAY BE TAPPED WITHOUT SADDLES. WHERE PVC MAINS ARE PERMITTED BY LOCALITIES, THE CONNECTION TO A PVC MAIN MUST BE TAPPED WITH A SADDLE. TAPPING SADDLES TO BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATIONS. ALL SADDLES TO BE STAINLESS STEEL OR EPOXY COATED.

MANUAL AIR VENT ASSEMBLY

NOT TO SCALE

REFERENCE	CATEGORY	DATE	SHEET No.	DETAIL No.
200,801,803	WATER & SANITARY	01/03	1 OF 1	WS_03



SEE WS_04, SHEET 2 OF 2 FOR NOTES.

STEEL CASING DETAIL

NOT TO SCALE

REFERENCE	CATEGORY	DATE	SHEET No.	DETAIL No.
200,801-804	WATER & SANITARY	01/03	1 OF 2	WS_04

STEEL CASING PIPE SELECTION CHART

DUCTILE IRON PIPE SIZE	4"	6"	8"	12"	16"
STEEL CASING PIPE SIZE (O.D.)	12	18	18	24	30

NOTES:

1. ALL JOINTS INSIDE OF CASING PIPE AND ONE JOINT BEYOND SHALL BE RESTRAINED MECHANICAL JOINTS OR AS APPROVED BY LOCALITY.

2. INSTALL CASING PIPE AS SHOWN ON DRAWINGS OR MIN. 5 FT. BEYOND EDGE OF PAVEMENT.

3. STAINLESS STEEL SPACERS

SPACERS SHALL BE BOLT-ON STYLE WITH A TWO PIECE SHELL MADE FROM T-304 STAINLESS STEEL OF A MINIMUM 14 GAUGE THICKNESS. THE SHELL SHALL BE LINED WITH A RIBBED PVC SHEET OF A 0.090" THICKNESS THAT OVERLAPS THE EDGES. RUNNERS MADE FROM UHMW POLYMER, SHALL BE ATTACHED TO RISERS AT APPROPRIATE POSITIONS TO PROPERLY LOCATE THE CARRIER WITHIN THE CASING AND TO EASE INSTALLATION. RISERS TO BE MADE FROM T-304 STAINLESS STEEL OF A MINIMUM 14 GAUGE THICKNESS AND SHALL BE ATTACHED TO THE SHELL BY MIG WELDING. ALL WELDS SHALL BE FULLY PASSIVATED. ALL FASTENERS SHALL BE MADE FROM T-304 STAINLESS STEEL. CASING SPACERS SHALL BE MODEL CCS AS MANUFACTURED BY CASCADE WATERWORKS MANUFACTURING COMPANY OF YORKVILLE, IL., MODEL SSI AS MANUFACTURED BY ADVANCE PRODUCTS & SYSTEMS, INC. OF LAFAYETTE, LA., OR APPROVED EQUAL.

4. SPACER WIDTH AND PLACEMENT INTERVALS

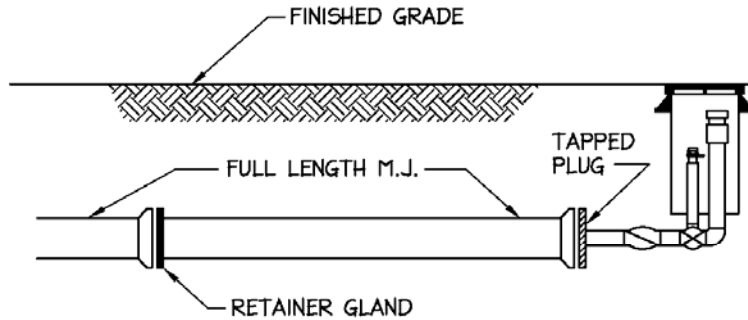
IN ALL INSTANCES SPACER SHOULD BE PLACED TO SUPPORT THE CARRIER WITHIN TWO FEET OF THE END OF EACH PIPE JOINT. CONSULT SPACER MANUFACTURER FOR RECOMMENDATIONS ON SPACER WIDTH AND ADDITIONAL PLACEMENT INTERVALS.

STEEL CASING DETAIL

NOT TO SCALE

REFERENCE 200,801-804	CATEGORY WATER & SANITARY	DATE 01/03	SHEET No. 2 OF 2	DETAIL No. WS_04
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* RESTRAINT LENGTHS BASED ON DUCTILE IRON PIPE ONLY.
WHEN PVC PIPE IS USED, RESTRAINT LENGTHS MUST BE RECALCULATED.



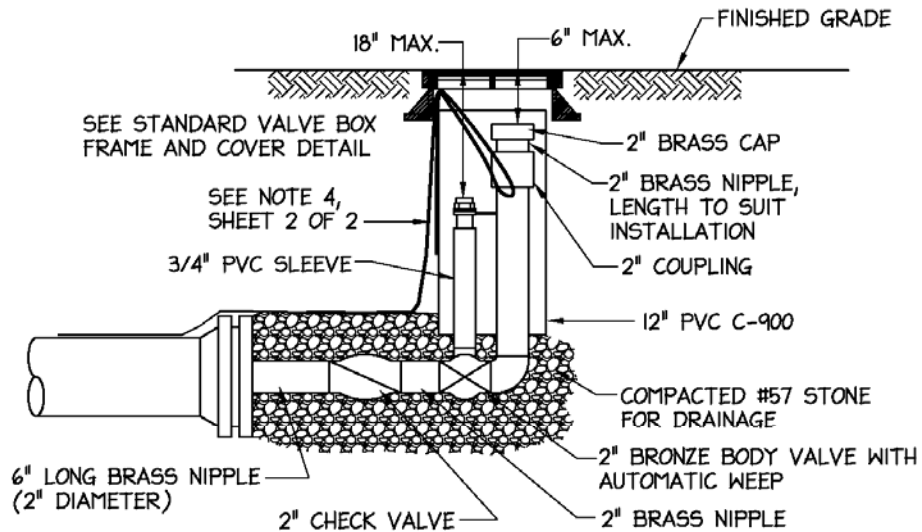
RESTRAINT LENGTHS:*

PIPE DIAMETER	LENGTH OF PIPE
4 INCHES	36 FEET
8 INCHES	36 FEET
10-12 INCHES	54 FEET
16 INCHES	72 FEET

RESTRAINT NOTES:

1. SPECIAL DESIGN REQUIRED FOR MAINS GREATER THAN 48" IN DEPTH OR IN SOILS WITH SHEAR STRENGTH LESS THAN 30 LBS/FT.
2. IF THE RESTRAINED JOINTS ARE LESS THAN THE LENGTHS SHOWN, THEN A SPECIAL RESTRAINT DESIGN MUST BE SUBMITTED FOR APPROVAL.

TYPICAL RESTRAINT



BLOW-OFF ASSEMBLY

SEE WD_05, SHEET 2 OF 2 FOR BLOW-OFF ASSEMBLY NOTES.

BLOW-OFF ASSEMBLY

NOT TO SCALE

REFERENCE	CATEGORY	DATE	SHEET No.	DETAIL No.
200,801	WATER DISTRIBUTION	01/03	1 OF 2	WD_05

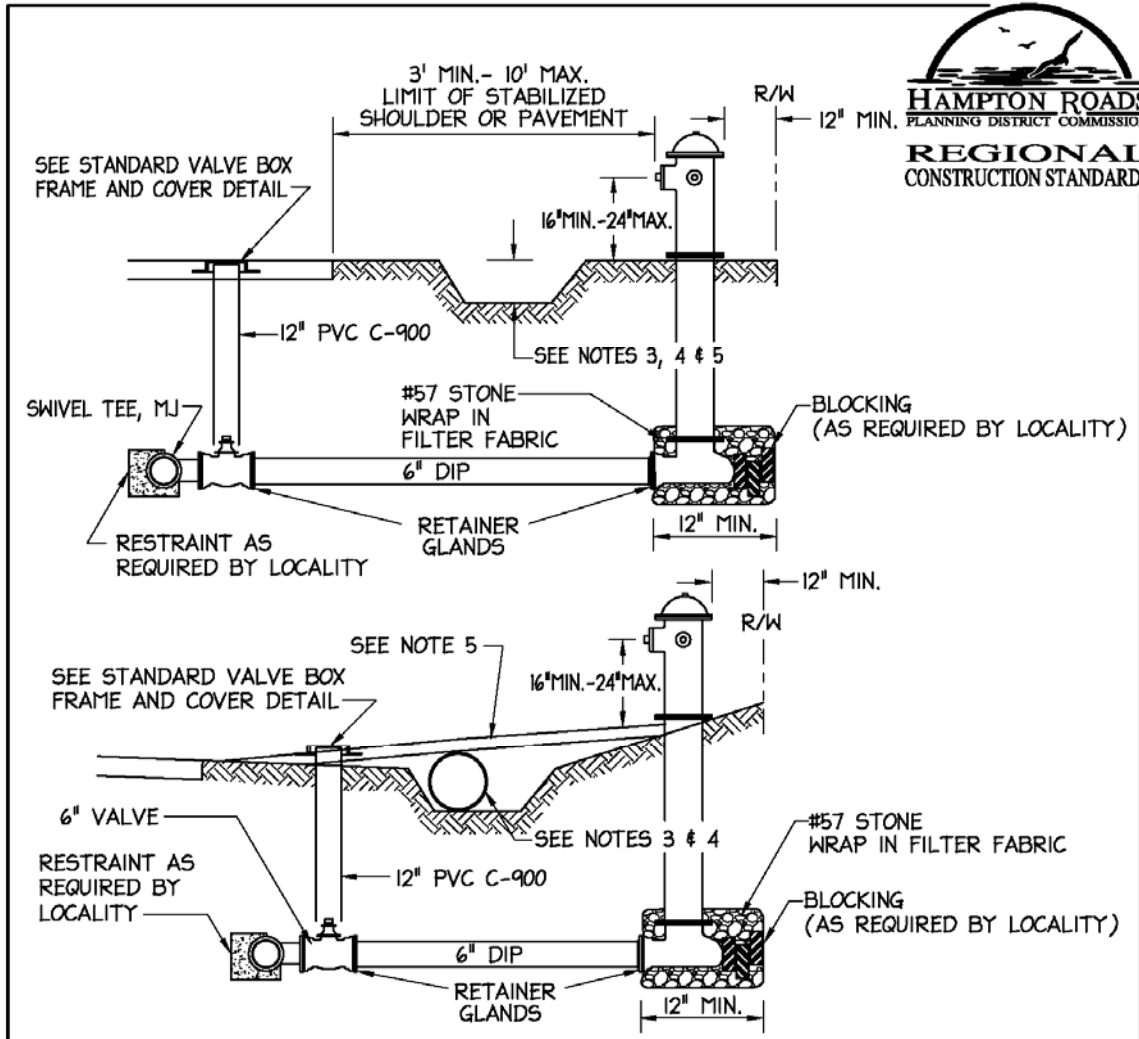
NOTES:

1. BLOW-OFF ASSEMBLY TO BE SUPPLIED BY GIL INDUSTRIES (MODEL: SLIM LINE 2" FLUSHING HYDRANT) OR APPROVED EQUAL.
2. A BLOW-OFF IS TO BE USED ON PIPE SIZES 10" IN DIAMETER OR LESS.
3. A FIRE HYDRANT IS TO BE USED AS A BLOW-OFF ASSEMBLY FOR PIPE SIZES 12" OR GREATER.
4. PLASTIC COATED 10 GAUGE SOLID COPPER TRACER WIRE TO BE ATTACHED WITH PLASTIC STRAPPING EVERY 10 FEET OF LENGTH. WIRE TO BE LOOPED THROUGH VALVE BOX AND EXTEND 12 INCHES ABOVE FINISHED GRADE AND COILED BACK INTO VALVE BOX.

BLOW-OFF ASSEMBLY

NOT TO SCALE

REFERENCE	CATEGORY	DATE	SHEET No.	DETAIL No.
200,801	WATER DISTRIBUTION	01/03	2 OF 2	WD_05



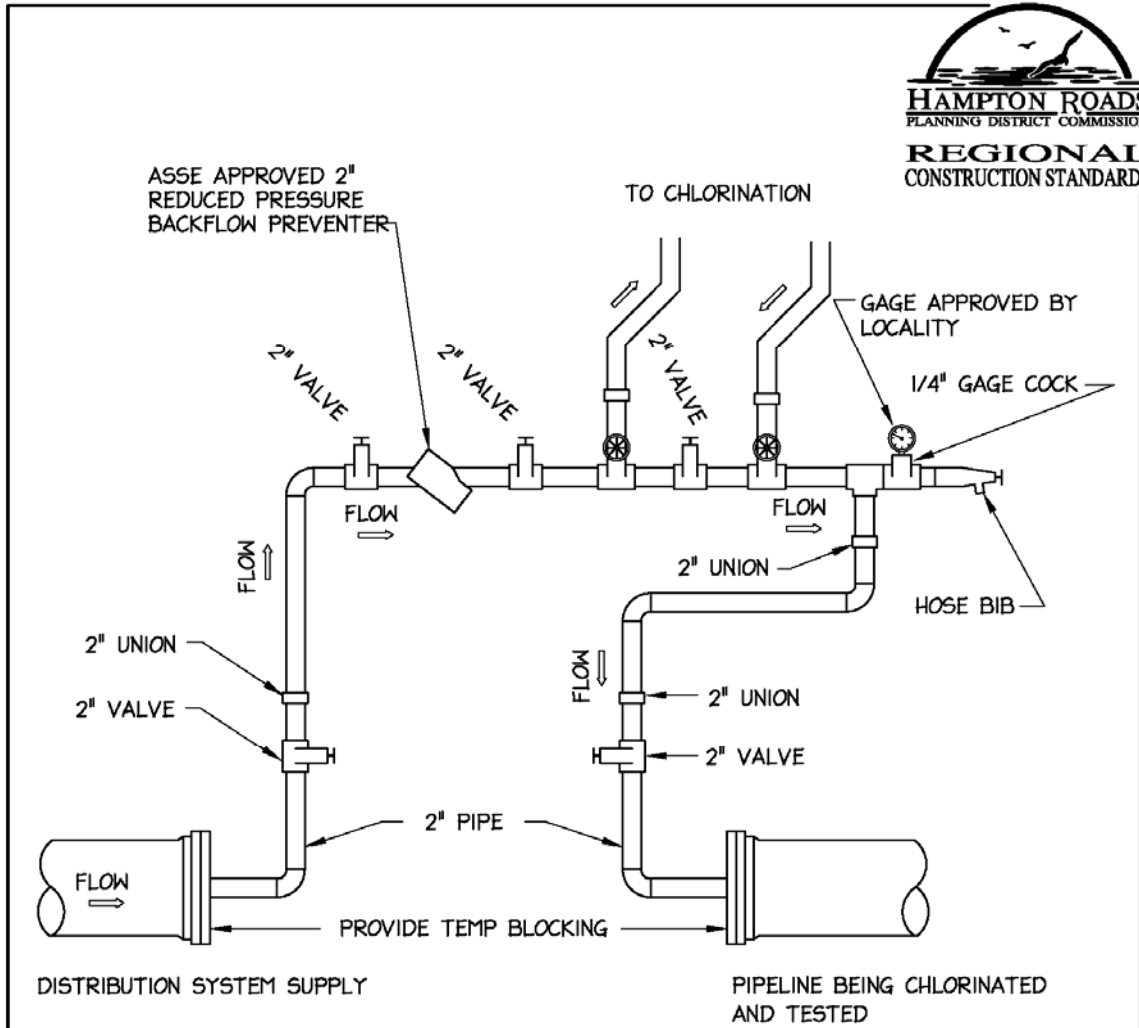
NOTES:

1. HYDRANT TO BE SET WITH BREAKABLE COUPLING APPROXIMATELY 3" ABOVE FINISHED GRADE.
2. STEAMER NOZZLE IS TO FACE ROADWAY UNLESS OTHERWISE NOTED.
3. CULVERT PIPE IS REQUIRED IF DITCH DEPTH (EDGE OF PAVEMENT TO BOTTOM OF DITCH) IS 18" OR MORE, OR HYDRANT VALVE FALLS WITHIN DITCH SLOPE.
4. SIZE OF CULVERT PIPE (RCP) IS TO BE APPROVED BY LOCALITY.
5. PROVIDE 6" MIN. COVER ON CULVERT AND 4" MIN. TOP SOIL AND SEED. FILL DITCH WITH CRUSHER RUN STONE.
6. TRACER WIRE REQUIRED.
7. ALL VALVES TO BE MJ.

FIRE HYDRANT SETTING (TYPE II)

NOT TO SCALE

REFERENCE	CATEGORY	DATE	SHEET No.	DETAIL No.
200,801	WATER DISTRIBUTION	01/03	1 OF 1	WD_07



DISTRIBUTION SYSTEM SUPPLY

PIPELINE BEING CHLORINATED AND TESTED

NOTES:

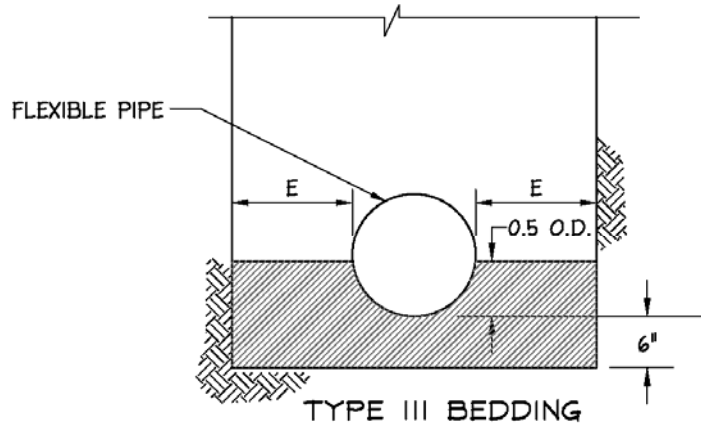
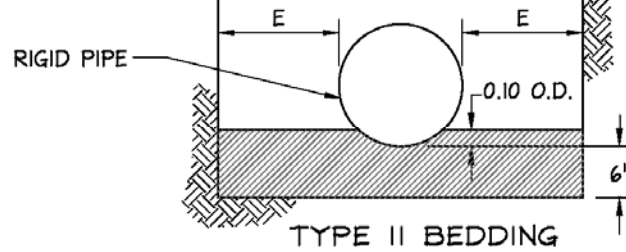
1. ALL VALVES TO BE 2" BALL VALVES.
2. ALL PIPING SHALL BE PROTECTED FROM THE WEATHER DURING FREEZING CONDITIONS.
3. BACKFLOW PREVENTER SHALL BE INSTALLED AND TESTED IN ACCORDANCE WITH THE LOCALITY'S APPROVED CROSS CONNECTION CONTROL PROGRAM.
4. THE RPZ SHALL NOT BE INSTALLED IN A PIT OR AREA SUBJECT TO FLOODING.

**TEMPORARY MANIFOLD FOR
TEST AND CHLORINATION**

NOT TO SCALE

REFERENCE (NONE)	CATEGORY WATER DISTRIBUTION	DATE 01/03	SHEET No. 1 OF 1	DETAIL No. WD_09
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PIPE SIZE	DIMENSION "E"
0"-24"	8"
27"-36"	12"
42"-72"	15"



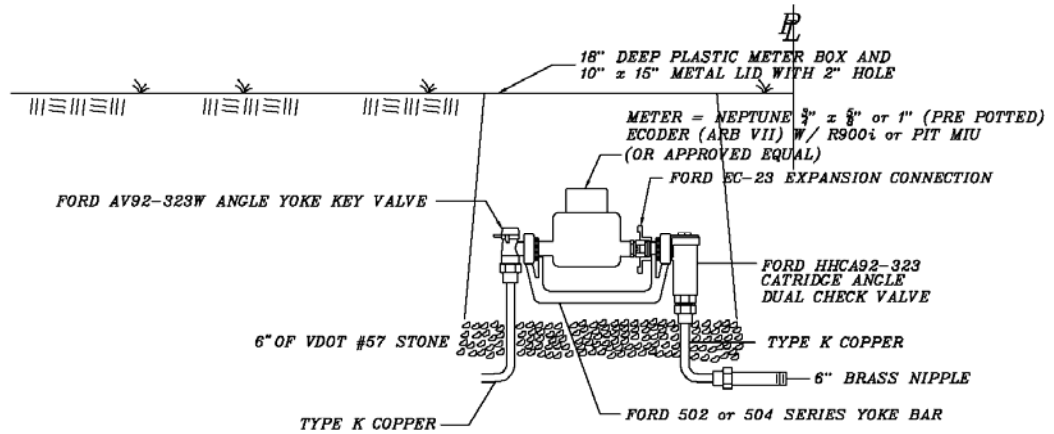
NOTES:

1. BEDDING MATERIAL TO BE APPROVED BY LOCALITY BEFORE USE.
2. TRENCH BOTTOM TO BE FREE OF WATER BEFORE PLACING BEDDING.
3. SHAPE RECESSES FOR BELL OF PIPE BY HAND.
4. BACKFILL ABOVE BEDDING WITH SPECIFIED BACKFILL MATERIAL. SEE SPECIFICATIONS SECTION 303.
5. REFER TO CONTRACT DOCUMENTS FOR TYPE OF BEDDING MATERIAL.
6. MINIMUM TRENCH WIDTH SHALL CONFORM TO PIPE MANUFACTURER'S RECOMMENDATIONS IF MORE STRINGENT.

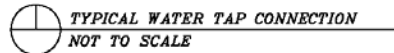
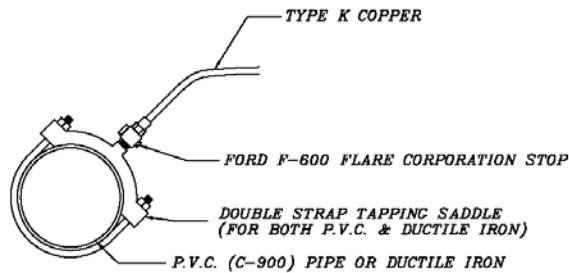
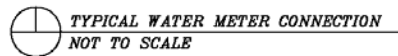
PIPE BEDDING DETAILS

NOT TO SCALE

REFERENCE 200,303	CATEGORY EARTHWORK	DATE 01/03	SHEET No. 1 OF 1	DETAIL No. EW_01
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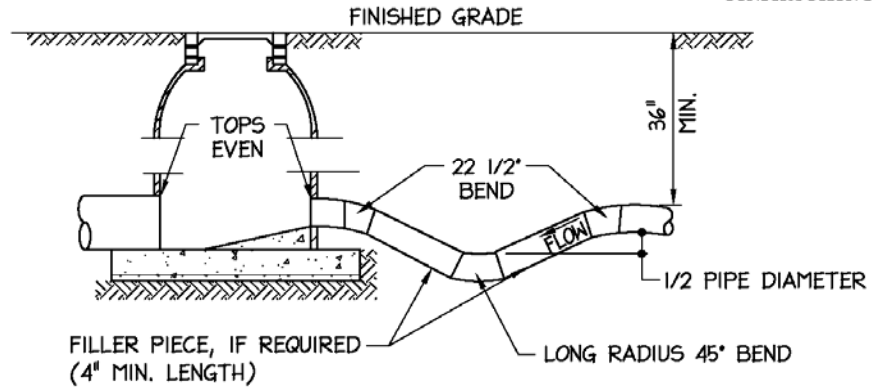


NOTE: METER WILL BE PROVIDED BY THE OWNER / DEVELOPER PER CITY STANDARDS

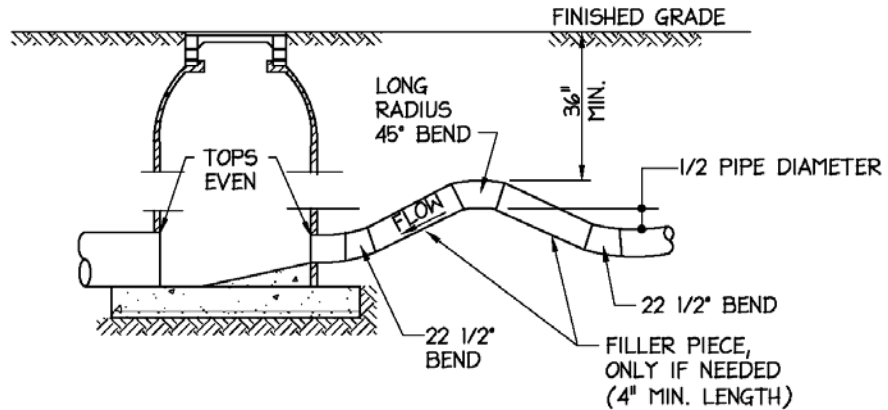


CITY OF FRANKLIN
 DEPT. OF PUBLIC WORKS
 "TYPICAL WATER SERVICE DETAIL"

Detail WSD_01



FOR DISCHARGE INTO SHALLOW MANHOLE



FOR DISCHARGE INTO STANDARD MANHOLE

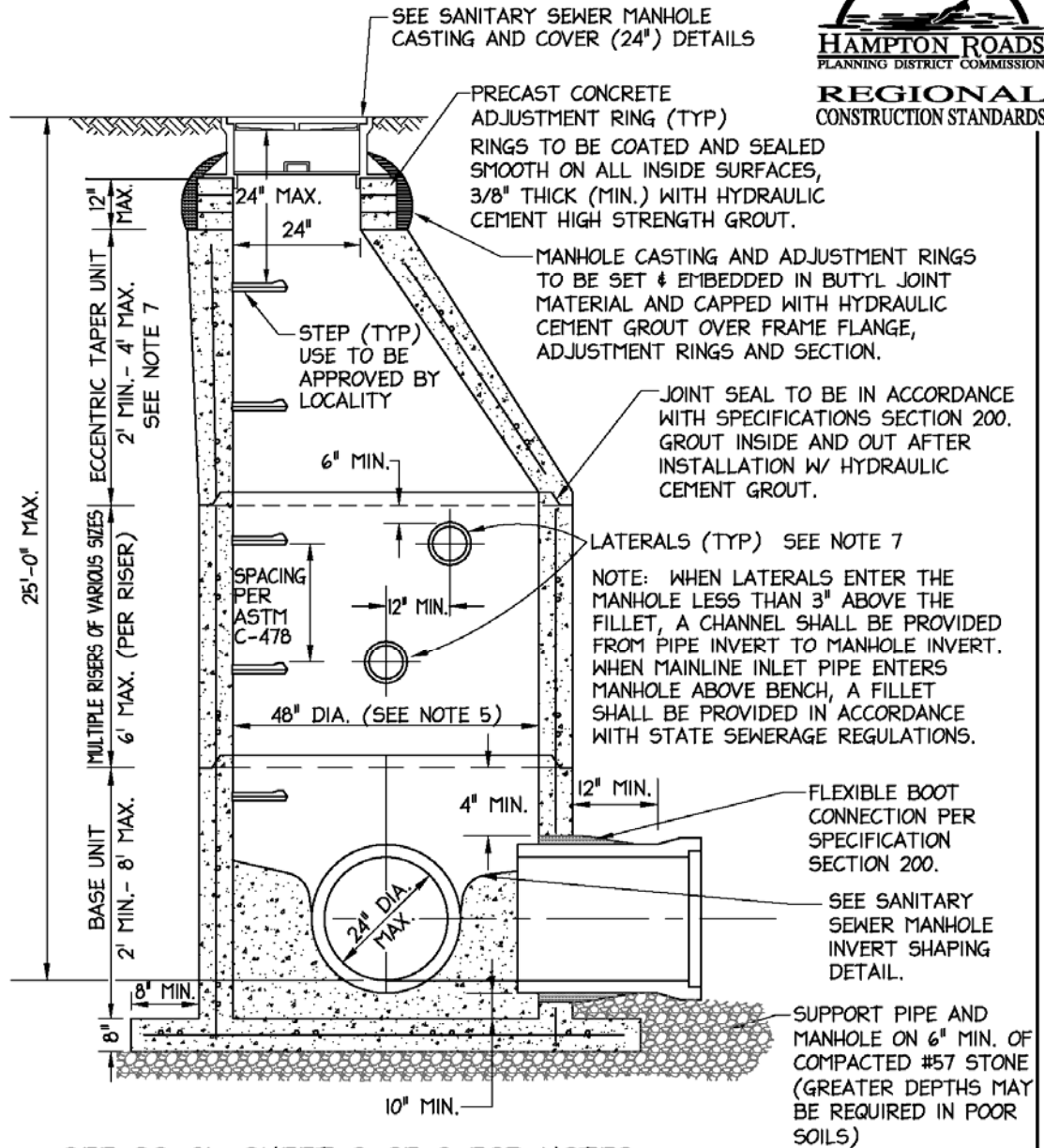
NOTE:

ALL JOINTS MUST BE PROTECTED BY RETAINER GLANDS OR THREADED RODS (GALV.). ALL RESTRAINTS SHALL BE IN ACCORDANCE TO LOCALITY REQUIREMENTS.

FORCE MAIN SAXOPHONE

NOT TO SCALE

REFERENCE	CATEGORY	DATE	SHEET No.	DETAIL No.
200,803	SANITARY SYSTEMS	01/03	1 OF 1	SS_17



SEE SS_01, SHEET 2 OF 2 FOR NOTES.

STANDARD PRECAST CONCRETE MANHOLE W/ EXTENDED MONOLITHIC BASE

NOT TO SCALE

REFERENCE	CATEGORY	DATE	SHEET No.	DETAIL No.
200,802	SANITARY SYSTEMS	01/03	1 OF 2	SS_01

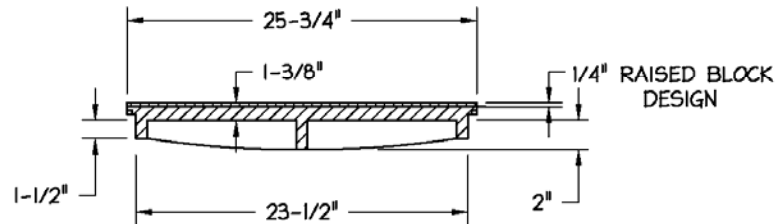
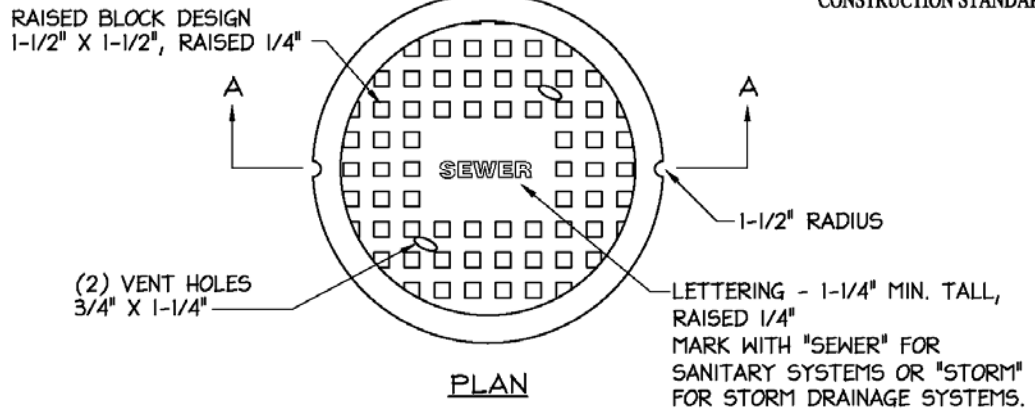
NOTES:

1. PRECAST CONCRETE MANHOLE TO BE IN COMPLIANCE WITH ASTM C-478.
2. WALL THICKNESS TO BE 5" MINIMUM FOR 48" INSIDE DIAMETER MANHOLES AND 6" MINIMUM FOR 60" INSIDE DIAMETER MANHOLES.
3. MANHOLE TO RECEIVE A FACTORY APPLIED COATING OF SIKAGARD 62 OR APPROVED EQUAL, MIN. THICKNESS TO BE 10 MIL. SIKAGARD 62, OR APPROVED EQUAL, TO BE APPLIED TO ANY EXPOSED INTERIOR SURFACES OF MANHOLE AFTER GROUTING.
4. PROVIDE A MAXIMUM OF TWO LIFT HOLES PER SECTION. PLUG LIFT HOLES WATERTIGHT WITH RUBBER PLUGS AND GROUT AFTER INSTALLATION.
5. INSIDE DIAMETER OF MANHOLE MUST INCREASE TO 60" WHEN MANHOLE DEPTH IS GREATER THAN 12 FEET. 60" DIAMETER TO BE CONTINUOUS UP TO CONE SECTION.
6. MAXIMUM OF FOUR LATERALS PER MANHOLE.
7. IF LATERALS ARE TO ENTER INTO THE ECCENTRIC TAPER UNIT, THEY MUST ENTER ON THE NON-TAPERED SIDE.

**STANDARD PRECAST CONCRETE
MANHOLE W/ EXTENDED MONOLITHIC BASE**

NOT TO SCALE

REFERENCE	CATEGORY	DATE	SHEET No.	DETAIL No.
200,802	SANITARY SYSTEMS	01/03	2 OF 2	SS_01



SECTION A-A

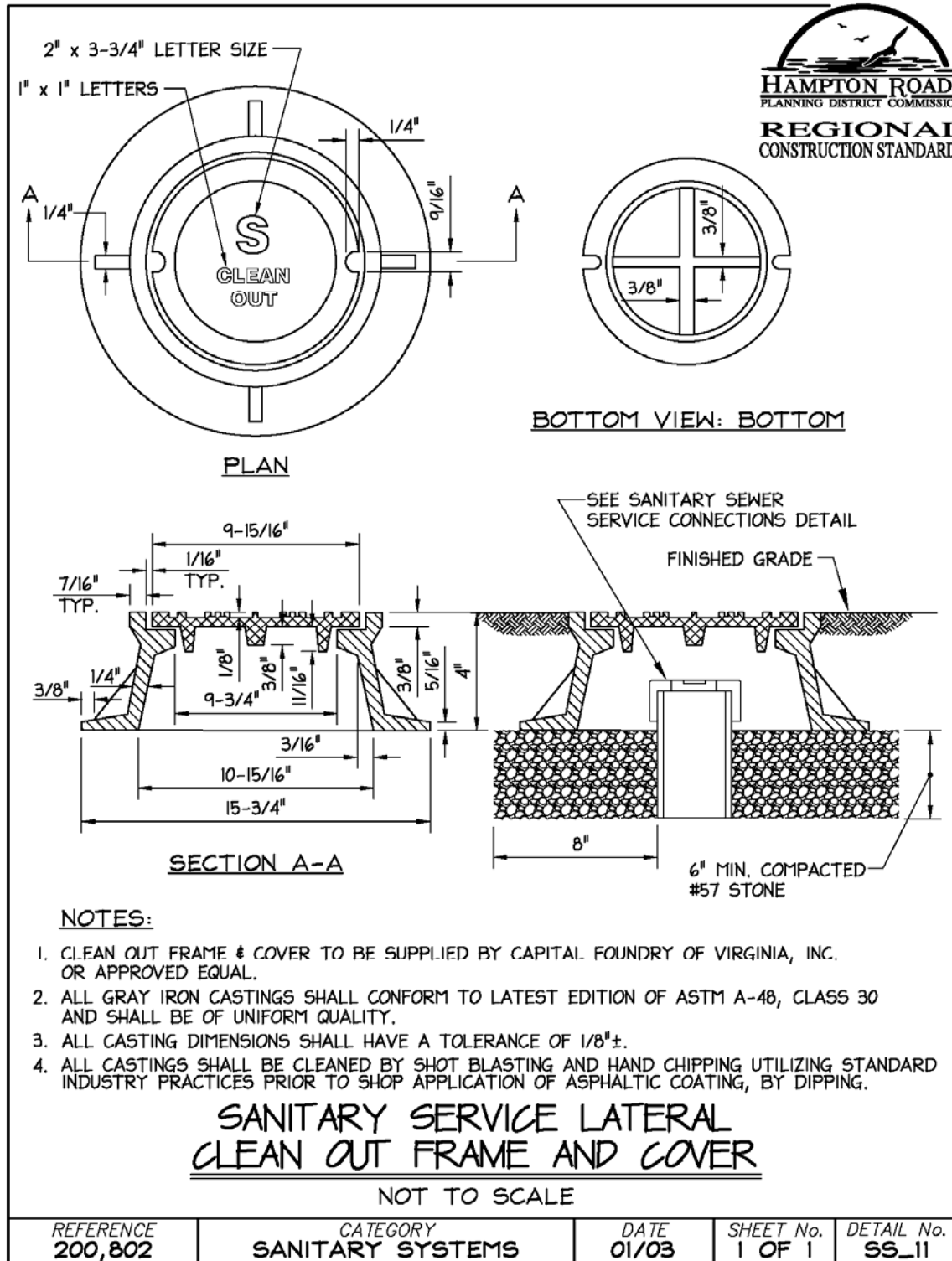
NOTES:

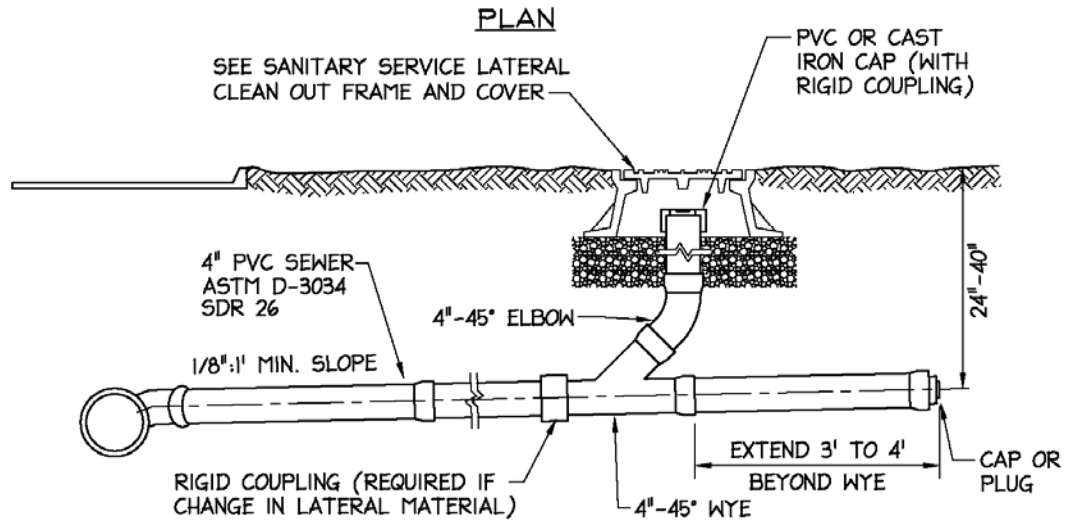
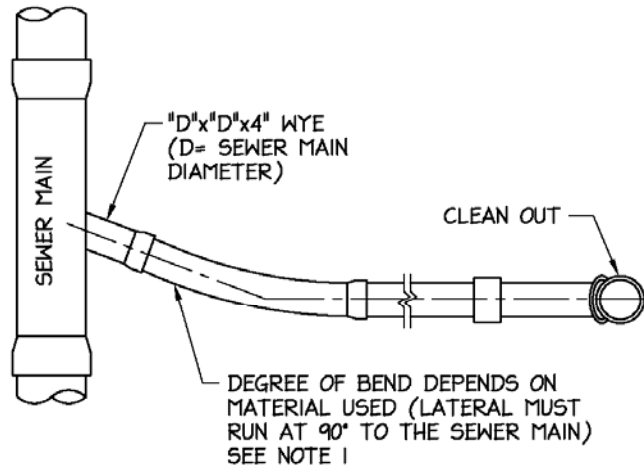
1. MANHOLE COVER TO BE SUPPLIED BY CAPITAL FOUNDRY OF VIRGINIA, INC., OR APPROVED EQUAL.
2. ALL GRAY IRON CASTINGS SHALL CONFORM TO LATEST EDITION OF ASTM A-48, CLASS 30 AND SHALL BE OF UNIFORM QUALITY.
3. ALL CASTING DIMENSIONS SHALL HAVE A TOLERANCE OF 1/8"±.
4. ALL CASTINGS SHALL BE CLEANED BY SHOT BLASTING AND HAND CHIPPING UTILIZING STANDARD INDUSTRY PRACTICES PRIOR TO SHOP APPLICATION OF ASPHALTIC COATING, BY DIPPING.

**SANITARY SEWER
MANHOLE COVER (24")**

NOT TO SCALE

REFERENCE	CATEGORY	DATE	SHEET No.	DETAIL No.
200,802	SANITARY SYSTEMS	01/03	1 OF 1	SS_10





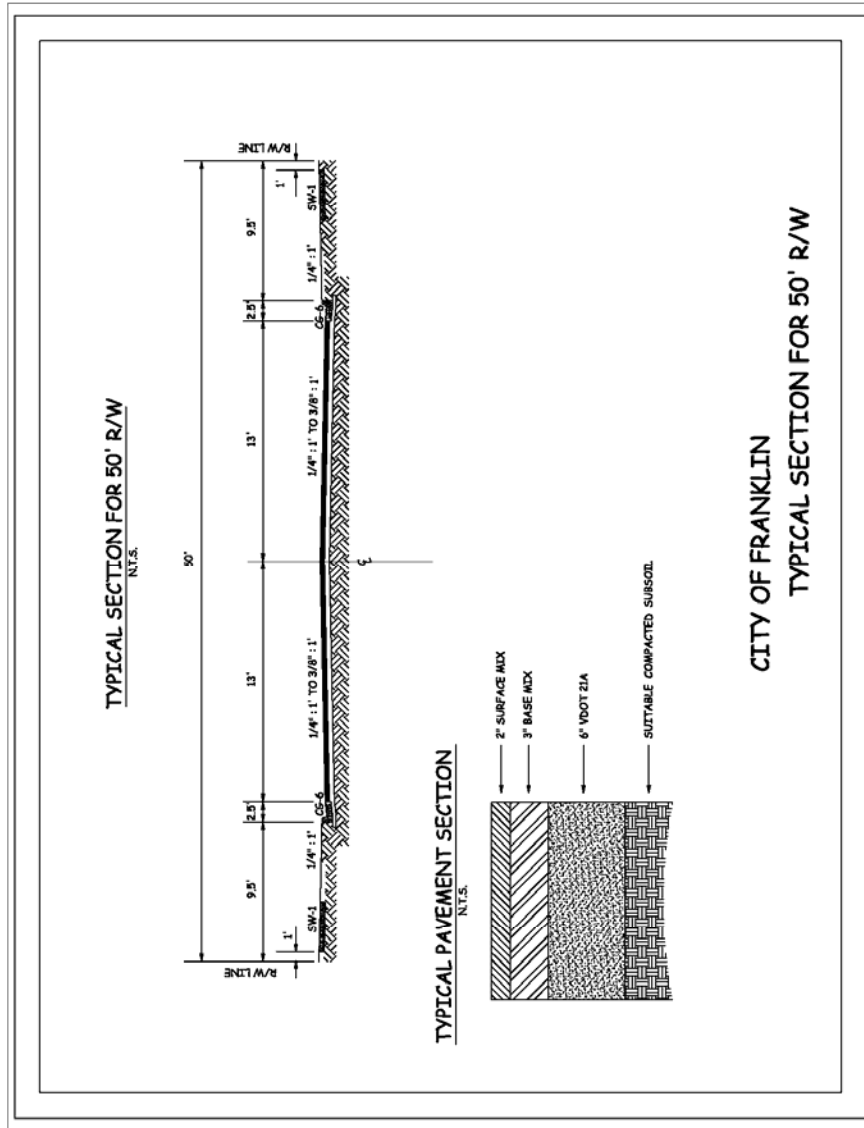
NOTES:

1. LATERAL PIPE SHALL BE PVC, ASTM D-3034, SDR 26, UNLESS DUE TO SPECIAL CIRCUMSTANCES THE LOCALITY REQUIRES THE PIPE TO BE DUCTILE IRON.
2. SEE PLANS FOR LOCATION OF CLEAN OUT.

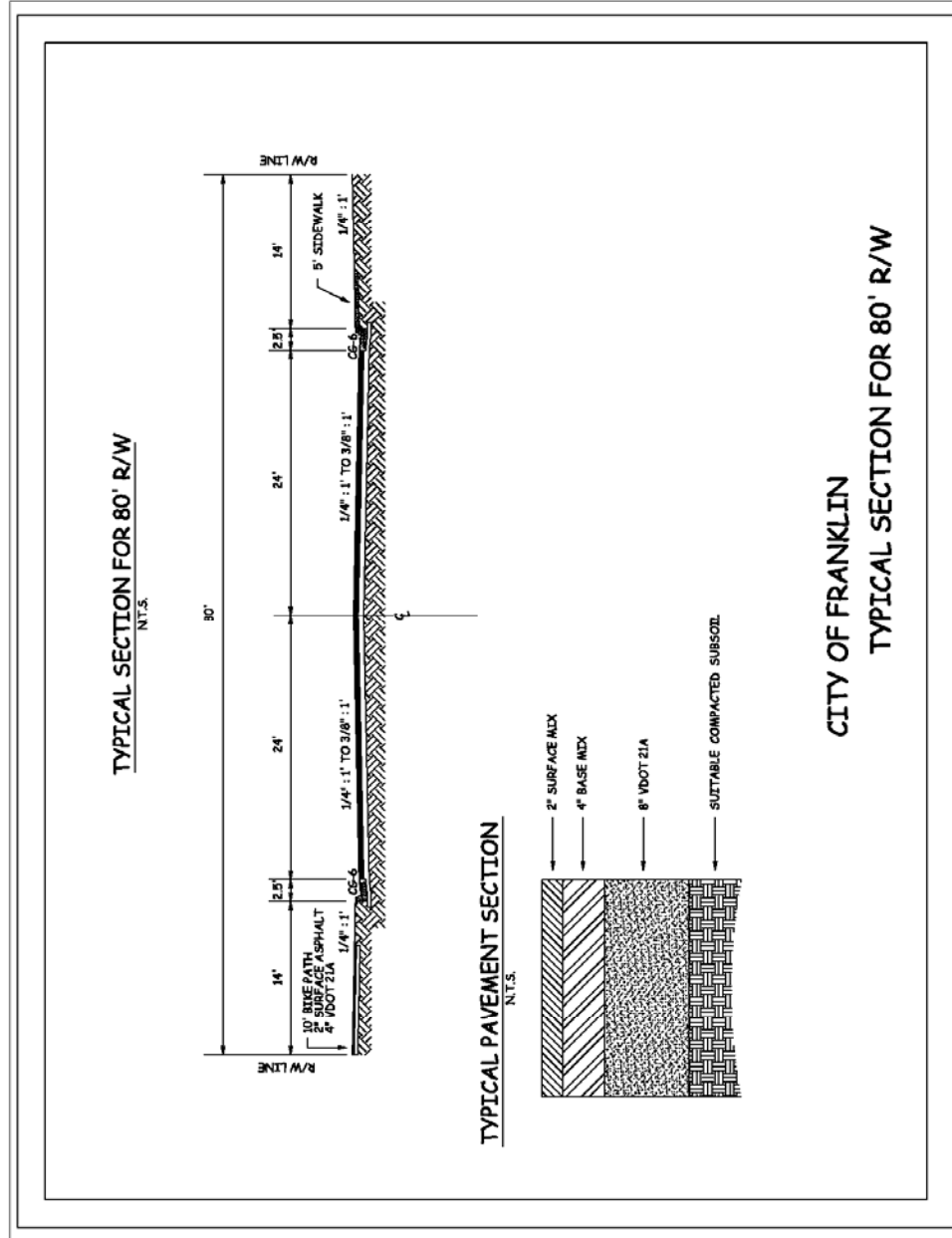
SANITARY SEWER SERVICE CONNECTION

NOT TO SCALE

REFERENCE 200,802	CATEGORY SANITARY SYSTEMS	DATE 01/03	SHEET No. 1 OF 1	DETAIL No. SS_14
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Detail ROW_50



Detail ROW_80